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MARINE ENGINEERING

AND SHIPPING AGE

INDEX TO VOLUME XXVIII

JANUARY TO DECEMBER, 1923

PUBLISHED BY

SIMMONS-BOARDMAN PUBLISHING CO.

30 Church Street, New York, N. Y., U. S. A.

34 Victoria Street, Westminster, S. W. I., London, England

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Marine Engineering and Shipping Age

Volume XXVIII

January, 1923

Number 1

Published Monthly by

ALDRICH PUBLISHING COMPANY

In Conjunction With

SIMMONS-BOARDMAN PUBLISHING COMPANY

Woolworth Building, New York

F. B. WEBSTER, Editor

H. H. BROWN, Managing Editor

L. S. BLODGETT, Associate Editor

W. Z. GARDNER, News Editor

Contributing Editors

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William T. Donnelly

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MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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Give the Standardization Committee Active Support

THE matter of the elimination of waste through simplified practice in shipbuilding and ship operating took very definite form at the meeting of the Standardization Committee at the Department of Commerce, Washington, on December 20. Had that committee existed prior to the war there is no doubt but what many millions of dollars would have been saved and many errors of judgment avoided during that trying period; while the chaos following the sudden termination of hostilities would not have been nearly as great as it was—and is. What would have been the outcome in the railway field after the frightful demoralization which resulted from government operation had that industry not started to clean house in the matter of variations in building and operating practices years ago and kept at it ever since? Then there is the more recent parallel in the automotive industry where the results have been marked. Again, right in our own field we have but to point to Great Britain, where the work of standardization began soon after the end of the war and is now proceeding deliberately and with well defined results.

But, "it is never too late to mend." The way is clear and the necessary machinery is almost ready, in the form of one of the ablest committees ever gotten together in the marine or any other field for any purpose. All that is now needed

is support—not passive, but active and hearty; and we have enough faith in the men from whom that support must ultimately come to predict that they will not be found wanting when called upon.

Labor Depends Upon Transportation

THE greatest blessing that any country can enjoy is steady employment at good wages for each and every one of its workers. This condition cannot be obtained in any nation unless its arteries of transportation are capable of handling the products of its farms and its factories expeditiously. Probably Henry Ford is prouder of the fact that he is giving steady employment to 100,000 men than of any other thing that he has accomplished. But Mr. Ford cannot continue to keep these men busy unless he can transport his automobiles not only to every place in this country but also to practically every port in the world.

It was stated and acknowledged on the floor of the Senate during the month just passed that 10,000 carloads of apples of the kind that we are paying ten cents a piece for here in New York city were dumped into the Columbia river from one section of the state of Washington alone. Neither sufficient warehouse space nor railroad cars for their transportation were available, but, if vessels equipped with refrigeration space could have been chartered at Seattle or Portland, the greater portion of this and similar crops could have been salvaged. And every shipload would have meant a payroll for the farmers and, through their increased purchasing power, employment for the workers of that section of the country.

Our statesmen have at last begun to realize that the influence of America is necessary to get Europe out of its economic chaos. Until it is made possible for the countries "over there" to resume normal production, the peace of the world is in danger. Even England has had, and still has, a serious unemployment question on her hands.

We have much to be thankful for at present. The indications, due to the immigration law, are that there will be plenty of work for everybody during the coming year, but this condition will not prevail, if either our rail or water transportation facilities are unable to handle the products of our industries. The ships of European maritime countries may at any time be withdrawn. Why then should we allow ourselves to depend on them?

Does not the Senate realize that the benefits to be derived from a merchant marine are general and not local? Does it not realize that the competition of an adequate American

merchant marine will insure reasonable transportation rates? Does it not realize that capital will not be interested in shipping unless the pending legislation is enacted into law, or must it wait until a catastrophe actually occurs?

Chamber of Commerce of the United States Urges Senate to Grant Government Aid to Shipping

ELLIOT H. GOODWIN, resident vice president of the Chamber of Commerce of the United States, has recently sent a letter to the members of the Senate urging favorable consideration of the ship subsidy bill. A communication of this kind, coming from such an institution whose special committees are constantly reviewing world conditions and their relation to our commercial prestige and national safety, ought to make a profound impression on any fair minded senator.

"In 1915," said Mr. Goodwin, "our membership, by a vote of nearly 3 to 1 favored subsidies from the Government, sufficient to offset the difference in cost between the operation of vessels under the American flag and the operation in the same deep sea trades under foreign flags.

"In March, 1920, in a new referendum the National Chamber's membership by a vote of over 15 to 1, coming from 44 states, the District of Columbia and American Chambers of Commerce, in Hawaii, Porto Rico, Alaska, Mexico, Italy, France and Cuba, favored a general declaration by Congress to give aid toward the maintenance of a privately owned and operated American merchant marine.

"Again in 1922 the subject was brought before our membership. At our annual meeting a resolution was unanimously adopted favoring an adequate privately owned and operated merchant marine, with aid from the Government which is essential to the maintenance of such a merchant marine.

"It was recognized then that our position as the second maritime nation of the world *newly gained as a result of shipbuilding operations during the war* could not be maintained without the grant of Government aid to present and prospective owners of our ships."

This newly gained commerce which Mr. Goodwin refers to as being a result of our shipbuilding activities during the war is strikingly illustrated in a recent report of the National City Bank of New York. This report says that the total exports for October, 1922, exceed any month in the past one and a half years. "They total \$372,000,000 and are not only the biggest of any one in the last 18 months but are nearly 20 percent above those of the immediately preceding month, 33 percent greater than in the opening month of the calendar year and 35 percent more than in the corresponding month of the preceding year."

An interesting feature of the increase in our export trade is the fact that the principal gains have been made by the manufacturers and exporters who are endeavoring to hold on to the business that they gained in the World War.

Comparing our export returns for the month of October with those of Great Britain, we find that our chief maritime rival suffered a loss of \$10,000,000 in her exports as com-

pared with the month of September. British domestic exports for October totaled \$294,000,000 as compared with about \$366,000,000 of domestic exports from the United States in the same month.

From a report just received from the Department of Commerce a new high record for the year was established for November, which shows that American industries benefited from the export business during that month to the amount of \$383,000,000. Comparing November, 1922, with the same period of 1913, an increase of more than \$138,000,000 over pre-war shipments abroad is shown.

Remembering that the United States is now clearly the leading nation in domestic exports whereas in 1913 Great Britain exceeded our domestic exports by over \$100,000,000, can anyone having ordinary common sense fail to see the important role that has been played by American ships even under Government ownership and the vital factor that they are bound to become to the future prosperity of the whole nation?

"Der Tag"

MR. McCAY'S splendid cartoon which appears on this page indicates the present status and the future of the American merchant marine in a far clearer way than it can be expressed by language. Many of us have waited through long dreary years for "der Tag" when America would resume, as of yore, her rightful place on the seas and in the ports of the world.

Time and time again our hopes have been raised that our people at last realized the vital necessity of an adequate merchant marine only to have them shattered through a lack of understanding and the sinister influence of foreign shipping interests. Some Americans seem to have a mania for



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Coming Out of the Fog

—McCay in the *New York American*

doing and saying things that will please our foreign maritime competitors and even certain daily newspapers in this great seaport of New York whose very existence depends upon American patronage have taken every opportunity to misrepresent every constructive effort that has been made to build up an American merchant marine.

How the American people, having the knowledge that the lack of an adequate merchant marine compelled this country to spend between three and four times its pre-war national debt for the construction of emergency ships, have allowed constructive action to be delayed thus far is beyond our comprehension and the only answer seems to be that it has been due to powerful forces working behind the scenes.

At last, however, and largely through the influence of President Warren G. Harding, the House of Representatives has, for the first time in our history, passed a general subsidy bill. We know how it is with the President and at this writing the Senate alone stands in the way of the fulfillment of the country's destiny. Business men naturally discount any deal that is not signed, sealed and delivered, but in this case we believe that Mr. McCay has accurately portrayed the future, because the opposing senators have only temporary or permanent Government ownership of shipping to offer as an alternative, which means that their position is too weak to prevent a 'show-down' before March 4.

The Motorship Outlook

IT has been the general belief that until the great surplus of cargo steamers owned by the Government could be sold to private owners and absorbed in the trade, shipyards could hardly expect much in the way of new construction except in passenger liners and special types of vessels. Admiral Benson, however, is showing the way not only to dispose of a number of these vessels but also to give the shipyards and repair yards a great deal of work in converting them into motorships at a cost upon which the fixed charges as compared with a steamer will not eat up the great fuel savings of the Diesel engine.

Admiral Benson is holding conferences with representatives of the shipyards and manufacturers of Diesel engines and equipment in order to determine the proper differential that the Shipping Board ought to place upon the steamers that it sells, as is and where is, and the vessels that it disposes of on condition that they are converted into motorships. In addition to this, the conferences are intended to bring out any points or ideas that will indicate how the total cost of the entire motorship machinery installation may be reduced to a minimum.

As the vessels owned by the Government may be classed in a very small number of types, the problem is entirely different from that of constructing new ships of varying characteristics. For instance, the question was brought up, cannot the sizes of the deck and auxiliary machinery for each class of vessels be standardized as to sizes?

It is plain that if such a work could be done by an authoritative committee—and considering the data that the Shipping Board must have on hand relating to the past performance of these vessels, it ought not to be so difficult a

job—immediate dividends would be realized in obviating the necessity for the cost of new plans and specifications by each purchaser.

Again, where fixed units are determined upon, it would enable the electric companies to reduce the cost of producing motors for the same to a minimum. In fact, would the matter not be reduced to a stock proposition?

While it is not our policy to at any time advocate machines of any particular manufacture, nevertheless we do think that by reducing the number of sizes and powers required concentration of effort will the more quickly produce units of maximum efficiency.

At the present time it may seem a bit facetious to suggest anything that savors of quantity production, but the fact should not be overlooked that the Shipping Board is prepared through concessions on its surplus stock of existing vessels to make it possible to obtain motorships in this country cheaper than they can be built anywhere in the world.

Tramp Contracts Signify Revival in English Shipbuilding

IN England those in close touch with the shipbuilding industry have said that the first sign of a genuine revival in the trade would be the ordering of a fair number of tramp steamers. Quite a number of contracts for ordinary cargo steamers of the tramp type have been placed in the United Kingdom during the last six weeks, so if indications that have heralded returning activity in shipbuilding in former times hold good a change for the better is in sight.

One of the most significant reasons why England has made such a great success as a maritime nation is the fact that British shipowners have always pursued the policy of disposing of their out-of-date vessels to foreigners. Although action of this sort has been prevented during the present depression by a lack of market abroad, it is fairly safe to prophesy that the next few years will witness a transformation in the British merchant marine in which post war designs of the most efficient type will prevail.

It should be recognized that the lack of the most up-to-date and efficient types of vessels is a far greater handicap to the success of any merchant marine than any wage or manning differentials now existing. England's maritime success proves this, for her wage costs are much higher, with the exception of the United States, than her competitors.

Just as surely as the iron ship and the screw propeller drove the wooden sailing vessel off the seas so will the most efficient vessels of the future which are capable of giving the greatest returns for the money invested make it impossible for a large percentage of the so-called surplus world tonnage to operate. And, further, when that time comes it will be found that new ships cannot be constructed as cheaply as they can be now. The new English contracts would not have been forthcoming if the bottom in prices had not been reached. America will profit by accelerating rather than retarding the tentative construction, reconditioning and conversion projects now in hand.

Sufficient Votes to Pass Subsidy Bill Are Assured; Night Sessions Will be Resorted to if Necessary

Senator Jones in Brilliant Address Tells in Plain Language Exactly What the Provisions of Bill in Present Form Are

THE Merchant Marine Bill with amendments to the House bill as proposed by the Committee on Commerce was reported to the Senate on December 9. The majority report favorably recommending a decision on the measure was signed by 11 members of the committee, and the minority report presented by Senator Fletcher was signed by 5 members of the committee.

At this writing fully 48 senators are committed to vote for the bill and only one of the doubtful class is necessary to assure its passage. Of course the principal anxiety of the proponents of the measure is the possibility that the opposition may succeed in delaying action until March 4. In order to prevent such a catastrophe to the welfare of our shipping, Senator Jones has determined to have the Senate convene at 11 o'clock instead of 12, wherever possible, to keep it in session until 5:30 or 6 every evening, and to insist on night sessions if it is found to be necessary. Friends of the measure will also be asked to attend all sessions regularly to prevent delays incident to roll calls where the point is made of no quorum.

NORRIS BILL CANNOT SUPPLANT SHIPPING ACT

Senator Norris has had a bill reported to the Senate which provides for a revolving fund of \$100,000,000 for the purpose of buying and selling farm products. It is not believed, however, that this bill, which is not the rural credits legislation sponsored by the Administration, can secure enough backing to block the shipping bill.

The rural credits measure is expected to be whipped into shape for presentation to the Senate during the first part of January, and then the shipping act will probably be temporarily sidetracked for the farmers' bill. The farmers' bill, however, will not take much time, as there is little opposition to giving all reasonable assistance to agriculture. After the Senate has assisted farming, it cannot consistently refuse similar aid to shipping.

SUBSTANTIAL CHANGES MADE

A few substantial changes have been made in the shipping bill as passed by the House by the Committee on Commerce. There are also a number of minor changes.

The taxation exemptions concerning the operation and sale of ships were stricken out. They are already in the Jones Act of 1920.

The amount of compensation that may be paid in any one year is limited to \$30,000,000, which is considered sufficient to provide for an American merchant marine carrying over 50 percent of our commerce.

The provision in the House bill requiring specific appropriations to be made annually from the merchant marine fund has been stricken from the bill. In its place it is proposed to forbid the Shipping Board from increasing compensation provided in any contract without a specific appropriation from Congress. It was believed that the provision of an annual appropriation even from an existing fund would prevent capital from investing in shipping ventures, although there is little doubt that Congress would live up to all legitimate contracts. In connection with this we might say that Congress has the power to repeal the Shipping Act at any time, even at the next session if it so desires,

but that it would not invalidate any contracts made up to the time of the repeal.

It is also provided that no contracts shall extend beyond 15 years from the enactment of the law. If at the end of that time we have not built up a merchant marine, it will be necessary to devise another plan.

SENATOR JONES' SPEECH

Senator Jones made a brilliant speech on December 12 and 13, which was a masterpiece for plain reasoning and plain language. While he attributed to the opponents of the shipping bill all the sincerity of purpose that actuates those who champion it, nevertheless, it is beyond our understanding how anyone having the privilege of hearing Senator Jones' address and at the same time knowing how the lack of a constructive shipping policy has kept American privately-owned ships out of the foreign trade for 60 years, can honestly and conscientiously oppose the present measure.

The following analysis of the shipping bill in its present form was included in Senator Jones' address, and to our mind it is the best explanation of the measure so far given, for it tells in language that everyone can understand just what this highly technical and complex act provides.

TITLE 1—AMENDMENTS TO JONES ACT—SALES

The amendment broadens the power of the board to make sales, but limits the minimum rate of interest to $4\frac{1}{4}$ percent, the maximum period of time over which payments are to be distributed to 15 years, and provides that the payments must at all times cover the depreciation of the vessel. The *Leviathan* may not be sold for less than the cost of reconditioning.

That is one provision put in in the House. There probably will be considerable discussion about that. It is going to cost about \$9,000,000 to recondition the *Leviathan*. Her sister ships were reconditioned by the British Government and turned over to the British companies for \$4,000,000. How we can hope anybody would take the *Leviathan* and pay the \$9,000,000 for her and then compete with these sister ships I do not know, but the Senate committee did not see fit to strike out that provision.

The sales policy is also amended to emphasize the desirability of maintaining routes from outports and of giving the domestic communities primarily interested the first opportunity for two years to purchase such routes. Domestic communities are defined. The bill affirms the purpose of discouraging monopoly in shipping.

INSURANCE

Purchasers on the deferred-payment plan are required to keep the equity of the United States insured, protected by hull insurance, and, if the board so requires, by protection and indemnity insurance. The board may create an insurance fund in which it may insure any plant or materials owned by the board or the equity of the United States on any vessel or in which a purchaser may insure the equity of the United States if he is unable to insure such equity in the American insurance market at as low a price as it could be placed abroad.

CONSTRUCTION LOAN FUND

The act of 1920 is amended so that the construction loan fund of \$125,000,000 may be created as the money becomes available instead of at the rate of \$25,000,000 per year. The loan may be used for the construction of the most efficient types of vessels or the installing of efficient machinery in existing hulls.

The loan is limited to an amount of two-thirds of the value of the ship constructed or re-equipped, and may not be loaned for longer than 15 years nor at less than $4\frac{1}{4}$ percent interest.

The Senate committee reported a proviso prohibiting the loan of this money to companies or corporations for the building

of ships for the carrying of their own products. The committee thought it was wise to make that limitation on that fund.

MAIL

The act of 1920 is amended by withdrawing the power which it gave to the Postmaster General in conjunction with the chairman of the Shipping Board to make contracts for the carriage of ocean mails. The ocean mail act of 1891 is repealed.

TITLE 2—EXEMPTION FROM TAXATION

Title 2 of the bill concerns taxation, and there were two provisions in that as it passed the House providing for an exemption from income tax on the operation of the ships and on the sale of ships. Those were provisions which were in the act of 1920, and it was hoped that under the conditions existing at that time many new ships would be built under those provisions, but for some reason the Treasury Department rules and regulations authorized in that act have not yet been made and approved, and so those provisions have not been put into operation. It was stated by the experts that there would be no practical benefits from those provisions at this time under the present laws and in present conditions, and so the committee struck out those two provisions from the bill as it passed the House.

TONNAGE DUTIES

Tonnage taxes are doubled for all vessels of such size as to make them, if otherwise eligible, recipients of direct aid.

TITLE 3—CONCERNS IMMIGRATION

This title declares the policy of the United States to be that one-half of our immigrants shall be carried in American bottoms. The President is directed to take such steps as may remove treaty stipulations conflicting with this policy. When no conflict exists, the policy is to be carried out under regulations approved by the Secretary of Labor and Secretary of State.

TITLE 4—CONCERNS DIRECT AID

MERCHANT MARINE FUND

A merchant marine fund is created from all tonnage taxes, 10 percent of all customs duties, and the direct aid refunded by owners who have made 10 percent profit or more in any one year.

THE CONTRACT

Section 403 authorizes the Shipping Board to enter into contracts for the payment of compensation. The contracts may run for 10 years and compensation shall be paid at reasonable intervals, not exceeding six months. The board may refuse for good reasons to enter into a contract on a vote of not less than five members.

The committee put in a proviso to that amendment relating to contracts, expressly providing that no contract shall extend beyond a period of 15 years from the enactment of this act. It was pointed out that under the language of the bill a contract might be made for 9½ years, and then renewed for 10 years, so that a contract might run for nearly 20 years. The committee inserted a proviso stating that no contract shall extend beyond the period of 15 years from the enactment of this act, which cuts out that possibility.

DETERMINATION OF AMOUNT OF COMPENSATION

The amount of compensation is based upon the distance steamed and the rate allowed per hundred nautical miles. The rate depends upon the size of the vessel and the speed of which she is capable, in the case of power-driven vessels, and upon the size alone in the case of sailing craft. Mileage is based upon chart distance between ports, except that a different distance may be allowed in special cases if the board deems it necessary.

The following requirements must be met by the vessels:

She must be maintained in the highest classification in the American Bureau of Shipping.

Two-thirds of her unlicensed crew must, after three years, be composed of American citizens, and the remainder must be eligible for citizenship. In the case of passenger vessels this does not extend to the steward's department.

She must be self-propelled over the mileage covered, except in cases of distress or in navigating harbors or inland waterways.

She must be built in the United States, except that certain vessels built before the enactment of the act may be admitted to compensation if registered under the American flag within three years and if five members of the board so vote.

She must be engaged in foreign trade as defined by the bill.

Certain feeder ships primarily serving the foreign trade of the United States are also eligible.

Three-fourths of the total fleet, owned, operated, or chartered by an owner receiving compensation, must be American.

VARIANCE OF RATE

The board may vary the rate of compensation set by the bill within limits of 100 percent either way upon a vote of not less

than five members of the board. According to the amendment recommended by the Committee on Commerce this will have to receive the sanction of Congress.

OBLIGATIONS OF COMPENSATED OWNER

An owner receiving compensation agrees that his vessels may be requisitioned in time of emergency upon a fair pre-emergency value. Sale of the vessel carries this obligation with it to the new owner. All repairs and renewals, other than distress repairs, are to be made in American ports.

The owner contracts to repay to the Treasury half of the amount by which in any one year his net income exceeds 10 percent on his invested capital until the amount of aid received by him in that year shall have been refunded. Detailed provisions are included for the administration of this section.

That, briefly, explaining it a little more, means this: Of course, it is not desirable, and it ought not to be the case, that compensation would be given to a vessel owner who is making a large profit in the operation of the ship. The committee does not desire that to be done. So we have provided that where the profit of the ship operator exceeds 10 percent in any year one-half of the excess comes back into the Treasury of the United States up to the amount of the compensation that may be paid.

TITLE 5—PERTAINS TO THE ARMY AND NAVY TRANSPORT SERVICE

Section 501 provides that where adequate commercial transportation exists military services may be discontinued by the President. The military departments are authorized to contract up to 10 years with commercial organizations for such services.

TITLE 6—PERTAINS TO RAIL AND WATER TRAFFIC

CREATION OF THE JOINT BOARD

The creation of a joint board from the Interstate Commerce Commission and the Shipping Board is authorized. Such board is to make recommendations looking to the correlation of rail and water traffic.

I will say for myself that I feel that that is one of the most important provisions in the bill. I feel that if we are going to have a merchant marine upon a permanent basis, even with the aid here given, we must co-ordinate and bring into close co-operation the railroad water lines of the country.

EXPORT BILLS OF LADING

The Shipping Board is to authorize the form of bills of lading for the water-borne portion of a through shipment of goods where the Interstate Commerce Commission establishes the form for that portion of the shipment over American railroads.

RAIL-OWNED WATER LINES

This section amends paragraph 9 of section 5 of the Interstate Commerce Commission act to the end that railroads may own steamship lines where the latter do not come into possible competition with any rail lines.

AGREEMENTS BETWEEN CARRIERS

Section 605 amends the shipping act of 1916 so as to amplify the power of the board to investigate agreements between common carriers or between common carriers and terminals.

JOINT OR PROPORTIONAL RATES

Section 607 amends section 28 of the merchant marine act by making it mandatory on the Interstate Commerce Commission to invoke or suspend section 28 as the Shipping Board certifies adequate or inadequate American transportation is available. Where the board and the commission are of the opinion that section 28 will cause congestion or will deflect unduly the natural channels of trade, the section shall be suspended.

TITLE 7—COMPRISES MISCELLANEOUS DIVISIONS

OFFICIAL TRANSPORTATION

Section 701 provides that the transportation of passengers and commodities paid for by the United States Government shall so far as practical be in American bottoms.

REPORT BY THE SHIPPING BOARD

The shipping act of 1916 is amended to include in the required annual report a complete report of the board's transactions with regard to the merchant-marine fund and the construction-loan fund.

One of the principal objections I have seen urged to the bill has been the failure to require the board to make these reports, but that provision was put in on the floor of the House, I think, and came over as a part of the House bill requiring them to submit the report.

HOME PORTS OF UNITED STATES VESSELS

The Secretary of Commerce is authorized to designate the port of documentation of American vessels, and such ports shall be

the ports where the greater part of the vessels' business is conducted.

SURRENDERED DOCUMENTS

The shipping act of 1916 is amended so that documents can not be surrendered in time of peace without the approval of the board.

REGULATIONS

Section 703 authorizes the Shipping Board to make the necessary regulations to carry out the provisions of the act.

Hurricane Proves Reliability of Motorship

IN the recent hurricane that swept the North Atlantic, against which even the giant liner *Majestic* could only make 5 knots, the single screw motorship *Munmotor* of the Munson Steamship Company gave a splendid demonstration of the reliability of the Diesel engine. The *Munmotor* is one of the Lake type vessels having fuller lines than are considered satisfactory for the Atlantic service. She has a length of 253 feet and a beam of 43 feet 6 inches and is propelled by a McIntosh and Seymour 4-cycle Diesel engine of 900 brake horsepower.

Although a complete report of the voyage has not been received at this writing at the Munson Steamship offices, it is understood that heavy seas broke over the forward deck damaging the cargo hatch and admitting enough water to shift the cargo and give the vessel a decided list. It should be noted here that the vessel was fully loaded with 4,000 tons of bulk coal at the time but that, in spite of the damaged condition, she was able to ride out the storm safely and then proceed to her port of destination.

A thorough examination of the engine since the storm has shown the machinery to be in excellent condition, and the only damage found was where the straining of the ship had loosened a few joints in the pipe lines. The performance is all the more noteworthy due to the fact that the ship is fitted with a single screw installation depending solely upon one engine.



(Photograph by Kadel & Herbert, N. Y.)

Sea Wall Made from Scrapped War Vessels

A new use has been found for obsolete warships; instead of being broken up, they are towed into place, filled with stone and made a part of a sea wall. The illustration shows a one time "Jed" being worked into a sea wall at Dartmouth, Eng.



Wrecked Tanker Lyman Stewart on the Rocks North of Cliff House, Golden Gate

Following a head-on collision in the north channel of the Golden Gate at the entrance to San Francisco Bay during a dense fog recently with the Luckenbach steamer *Walter A. Luckenbach*, the Union Oil Company tanker *Lyman Stewart*, outbound to Seattle with 65,000 gallons of crude oil, was abandoned on the jagged rocks just north of the Cliff House, where, with a deep hole torn in her port side, she had been swept by the heavy ebb tide. The *Lyman Stewart* is of 5,919 net tons, built in 1914 at the Union Iron Works, San Francisco, Cal.

Sidelights on the Shipping Bill

By "Old Scotch"

"Well begun is half done" is an old adage, applicable to many undertakings in life and particularly so to the shipping bill now in the process of transformation into the law of the land. To one who attended the sessions of its turbulent passage through the House of Representatives there are a number of interesting sidelights not covered in the press reports, some of which are outlined in this article.

THE outstanding impression one gained from the onslaughts of the opponents of the ship subsidy bill is their absolute selfishness and unfairness to the maritime interests of the country.

The term "subsidy," wished on the measure by its opponents, was anathematized to a fare-ye-well. In itself the term means nothing of the sinister definition applied to it. The word "tariff" means just the same thing, so far as the effect is concerned.

HYPOCRISY OF THE OPPONENTS

Much of the bitter invectives hurled at the shipping bill came from members in the West and Northwest, who but a few weeks ago were imploring the House to place duties upon agricultural and other products of their particular districts. The opponents from the South, who were the most active in their denunciation of this alleged "raid upon the Treasury," are always in the front rows begging for large appropriations for "good roads," "rural free delivery," "boll weevil cures," "pellagra funds" and what not, because, forsooth, they were beneficial to their particular districts. Has anyone ever heard of the representatives of districts interested in shipbuilding and ship operation ever opposing measures of that kind, even though their districts received no particular benefits from such legislation?

Millions of dollars have been spent for reclamation of arid lands, to benefit the agricultural interests of the great West. Is not that a subsidy? and a beneficial one at that? The maritime interests have always lent their aid to all of these meritorious projects, else they never could have become laws.

AID FREELY GRANTED FOR BUILDING RAILROADS

If we want to confine this argument to means of transportation, which is all that the shipping bill calls for in fact, let us but harken back to the days a half century or so ago, when the great transcontinental railroads were built. Private capital could not be enlisted in these great undertakings, because they would not pay attractive or, in fact, any interest rates. But the great object to be accomplished was so transcending that our representatives then in Congress, and real statesmen, too, granted vast acreages of the public domain and guaranteed the bonds necessary for the construction of these roads. Has the Government ever made a better disposition of its lands and its credit? Is there any marked difference between starting these lines of communication on the land, than there is in this proposed establishment of lines on the seas? A nation's shipping is but the continuance of its rail facilities on land.

The great middle states of Ohio, Indiana and Illinois supported the measure valiantly, and their representatives in the House made some of the best speeches in its favor. Can their interests be any different than those of the representatives of Iowa, Minnesota and Wisconsin? As a body they are apparently as intelligent. Their opposition must therefore be attributed to innate selfishness, for those particular states have been the most insistent for high tariffs on their wheat and other products of the soil. The consumers of the greatest portion of their crops are located in the great centers

of population along the Eastern seaboard. We who live here and wrest a livelihood from the business of sea transportation do not care particularly to have the price of our daily bread greatly increased by the tariff in order that the farmers of Iowa and Minnesota may make a living wage from raising wheat and corn, but we realize that our agricultural interests must be made remunerative in order that the country may be prosperous, and we accept the conditions placed upon us by Congress cheerfully.

We who build and operate ships have as much right to have our occupations protected as have the farmers. You cannot place a protective tariff on ships sailing the Seven Seas in open competition with all the world, so our only means of protection is for the Government to help us make up the difference in labor costs between the American standard and the standards of our low cost labor competitors on the ocean.

SELFISH ATTITUDE OF AGRICULTURAL REPRESENTATIVES

Do the representatives of the farmer districts realize that, if this shipping bill, or something equal to it, is not passed and very soon, it will mean the closing of over 75 percent of all the shipyards in this country, and the throwing out of employment of thousands of men? Have they forgotten that the disarmament program, which eventually must benefit the whole world, has already thrown out of employment not less than 25,000 men who were and have been from youth employed in shipbuilding? Are these men and their families alone to bear the brunt of a policy which benefits all other of the great industries in the country? Must one industry such as this be annihilated and the honest men, who have heretofore gained their livelihood in shipbuilding, be thrown out on the streets, because of a spirit of selfishness and unfairness on the part of certain of our agricultural representatives in Congress who would take away their last chance of employment by denying the shipping interests that which is their just due?

Most of us have been taught that the American farmer is our highest type of citizen, both in patriotism and intelligence, the very backbone of our citizenry. We still believe it, but if their elected representatives, who frothed at the mouth at the very mention of a measure to help the shipping industry, reflect the sentiments of their constituents, it must be because of an absolute lack of knowledge of the actual conditions. If every farmer in the United States has carefully read President Harding's recent message on the shipping situation, there ought to be some new faces in Congress from certain Western districts two years hence, and undoubtedly there will be.

SHIPPING AS A MEANS OF NATIONAL DEFENSE

Another outstanding feature of the six days' debate was the subordination of that phase of the shipping situation, connected with our national defense. The commercial side is of great importance naturally, but the preparedness side of the issue should have been given greater prominence than it received. The clause regarding payments to the so-called "Industrial" ships was unceremoniously stricken from the bill, because the names of Standard Oil and United States Steel Corporation were included among the beneficiaries. Of

course it would take a pretty brave Congressman to explain to his constituents that he had voted to pay money to either of these great, wealthy concerns for carrying on their own business. From the strictly commercial side of the bill it must be admitted that the average citizen would require a lot of demonstration to believe it advisable. Not, however, if he would view it from the broad standpoint, that the money for operating these ships could be kept at home by the small payments authorized in the bill. In domestic trade a few cents added to the cost of gasoline would soon make up any differential in operating costs. But when these great oil companies go into the foreign trade, they must meet very keen competition.

TANKERS ESSENTIAL IN WARFARE

It is from a standpoint of national defense that this great fleet of tankers should be considered. If Government help is not extended to those operating in foreign trade, it is a foregone conclusion that they will either be tied up and soon deteriorate, or else they will be transferred to foreign flags, where most of them were before the outbreak of the great war. No type of merchant ship is more valuable to the Government than tankers, in time of war. Whether hostilities are conducted on the surface of the ocean, underseas, or in the air, vast quantities of fuel oil and gasoline will be required, and will be as indispensable as explosives. Without a large fleet of tankers ready at a moment's notice, we would be helpless to conduct any kind of war, even though the scene of action was within our own borders.

At a certain stage of our own part in the last war, such oil carriers would have been worth \$10,000,000 each, as it will be remembered that our fleet was very small at the outset of our entry into the war, and several of the largest tankers were sunk by submarines. There seems to be but little chance of having the "Industrial" fleet compensation put back into the bill in the Senate. Hence the prejudices of

certain of our misguided Solons, may eventuate some day in a national calamity.

LESSONS OF THE WAR MUST NOT BE FORGOTTEN

This only illustrates the general tenor of our lawmakers' attitude at this time. So far as many of them are concerned the late war might have happened fifty years ago instead of but five. So far as our dependability on merchant shipping is concerned the lessons of that great conflict have already been forgotten. The nearly four billions of dollars which were then feverishly invested in improvising a merchant fleet, to make up our delinquencies for the past fifty years, could have been mostly saved to the taxpayers, by the payment during that period of an average of \$5,000,000 annually in aid to our merchant shipping. Now and for many years to come the taxpayers of this country will be burdened with a tax of not less than \$150,000,000 annually, to pay the interest alone on that portion of our debt incurred in building ships. Who can tell how long it will take to pay off the principal? What a monument to Congressional short-sightedness! What a commentary on sectional selfishness and unfairness!

But there is still hope that we may overcome a repetition of such foolhardiness. The passage of the bill in the House by the comfortable majority of 24 votes marks the first time in history that the lower House has ever passed legislation of this kind. The thorough debate and the wide publicity given to the President's able message on the subject must have some good effect. In spite of the dire threats of certain elements in the Senate to defeat the measure, the American people certainly will not see this measure defeated. If the public will but think of the lessons of the past, and insist on their representatives in the Senate rising above selfish and provincial ideas, the bill will yet become a law, crippled although it may be. The bill is a constructive piece of legislation and should pass without delay.



Cunard Liner Tyrrenhia, Built and Engined by William Beardmore and Company, Ltd., Dalmuir, Glasgow, Scotland

This vessel is a twin screw, double reduction, geared turbine, oil burning steamer, 580 feet in length, 70 feet in breadth, of 17,000 tons gross, 13,500 shaft horsepower, and 17 knots service speed. She has accommodations for 265 first class, 370 second class and a large number of third class passengers. In common with all Cunard Line ships built since the close of the war, space is economized greatly by the adoption of geared turbine machinery and oil fuel, which allows power to be increased and calls for only one large funnel, thus leaving much valuable amidships space for the use of passengers.

Recent Developments in Marine Insurance

Instructions to Salvage Branches—Lightning Covered—War Risk Refunds—Ship Repairs Liability—Lake Cover Extended

By "Bordereaux"

FOLLOWING the final report of the cargo underwriting conferees to the Shipping Board authorities, extended allusion to which was made in this department last month, the United States Salvage Association has issued explicit instructions to all its branch offices outlining the service expected of them in order that the association may fully realize the hopes of the board and the underwriters in the matter of co-operative efforts to maintain a high standard in the condition of the board's vessels. By the terms of the report, it will be remembered, the responsibility was placed fairly upon the shoulders of the Salvage Association for seeing that the upkeep of the boats is maintained on a basis that warrants the continued granting of the "liner" and "approved steamer" ratings already arranged by the underwriters. Those ratings are to be conditional upon the maintenance of a standard of upkeep that meets with the approval of the Salvage Association. In its instructions to its branch offices the home office of the association insists upon the greatest care in considering the following factors:

(1) It must be seen that each vessel trading out of each branch's district does not put to sea in an overloaded condition. Cases of overloading must be promptly reported to the association's home office, to the agents of the locality, and to the Shipping Board authorities for action.

(2) Periodical surveys will serve as a medium for determining the physical condition in which these vessels are being maintained, but they must be followed up to ascertain if the recommendations of these surveys are carried out. The home office must be immediately notified of any failure to carry out the recommendations. These condition surveys should be made to cover in addition to the information called for therein any other feature of construction or operation which would materially detract from the vessel's cargo-worthiness or improve her standing in that respect. Such recommendations would cover such items as unprotected sanitary and scupper pipes, insufficient ventilation in cargo holds, the removal of steam and exhaust lines from cargo holds when such a step is advisable for the safe carriage of dry and perishable cargoes, unprotected steam pipes, unsheathed bulkheads on tanks carrying fuel oil, and other similar items. Such items as these must be brought to the particular attention of the operators, the local Shipping Board office, and also to the attention of the home office, together with the necessary recommendations for their correction. When urgency dictates, telegraphic information on such points is to be resorted to, in order that the least possible delay may be had.

(3) One of the original recommendations of the Cargo Conference Committee expressed approval of the desire of the Shipping Board to eliminate the shifting of personnel on its vessels, and particularly stressed the point that the chief engineers should follow their ships. It is therefore expected of the branch offices that whenever any of the designated ships are under their observation they shall acquaint themselves with the character of the personnel, particularly as respects the feature just mentioned.

The home office is to issue periodical bulletins which will advise the underwriters of the status of each of the vessels comprising these various fleets. It is therefore necessary that prompt information be forwarded with respect to any shortcomings in any of the vessels trading out of each branch's

district. The concluding language of the instructions is as follows: "We shall place upon your office the responsibility for the condition of any of these vessels leaving your district, and for the manner in which cargo is carried, in the sense that cargo damages resulting from defects in the condition of these vessels, which should have been eliminated before sailing, must be eliminated."

Lightning a Sea Peril

IN a recent opinion under an inland marine policy as to the liability of underwriters for loss by lightning doubt was expressed by a prominent admiralty lawyer as to whether the insurer could be held responsible, and the result has been to arouse so much uncertainty in the minds of brokers and the assured that frequent requests are being made to underwriters to include the word "lightning" in the perils clause of the policy.

The absence of decisions on the subject by the courts seems to have worried the lawyer, but the view of the underwriters is that the paucity of interpretation of the subject arises from the fact that lightning is a peril that would never be called into question by them. It is possible that the specific inclusion of lightning in fire policies has led to confusion in the minds of some, but it takes but little thought to appreciate that there is but the slightest analogy in scope between the perils clause of a marine policy and the single hazard of fire in a fire policy. Not only does the former specifically cover fire, but it includes loss or damage from all perils of the sea. The fortuitous nature of the happening is vital. It is, in the language of an authoritative court, "something which could not be foreseen as one of the necessary incidents of the adventure." This is, in point of fact, an excellent definition of lightning.

While it may be argued that it is not peculiar to the sea, it nevertheless remains that such a test is not applicable to sea perils, no more than winds would be. Nor can a parallel be drawn with rainwater damage, which is held not to be a peril of the sea; rain is a usual and necessary incident of the adventure, and damage from it can be foreseen and prevented with ordinary precaution, and that element of care enters into packing and handling of goods. In the judgment of most underwriters there is no question of the inclusion of lightning in the term "perils of the sea," constituting, as it most certainly does, a fortuitous happening.

Low Hull Rates

UNDERWRITING hulls is now going on briskly, with accounts being made up to attach January 1. Complaints are general, on both this side of the Atlantic and the other, of low valuations and the continuance of high repair costs. It is stated in England that the insured value of a modern tramp steamer of over 1,000 tons is based on about £8 to £10 per ton, and that risks have been placed on values as low as £6 per ton. Save in only exceptional instances the £15 and £20 valuations of a year ago are unheard of today. In the present condition of the shipbuilding industry there is believed to be no profit in such rates and values as now obtain. Underwriters rest their sole hopes

in possible reductions in repair costs, and this has been promised in England, if the proposed reduction in shipyard wages becomes an accomplished fact, and that appears certain now.

Would Reclaim War Risk Premiums

THE close of the year was signalized by a widespread movement among American importers and exporters to lay the foundation for a demand upon the German Government for the return of war risk premiums paid by the former during the period of 1914-1918, on the ground that this was an expenditure caused by the operations of German submarines and cargo-raiders. There are hundreds of millions of dollars of German funds sequestered in this country, and the idea was to press for recovery from this vast sum and to make use of the United States Government's special commission on redeemable war costs for the purpose. The time limit for presenting claims to this commission expired with the year, hence the importunities of numerous brokers during December for their underwriters to supply them with statements of their clients' war risk premium payments. This finally developed into the greatest sort of a nuisance to the insurance men, already overworked with the year-end special duties, and many offices made a charge for the extra work of 10 percent of the premiums, and some even added a \$20 bonus for good measure.

It is the practically unanimous opinion of the underwriters that this movement is a great mistake, that it is wrong in principle, unjustifiable, and with next to no likelihood of resulting successfully. They insist that the war risk premiums were, at the time, passed along to the consumers, and that the insured therefore have never been out of pocket because of them. Furthermore, the underwriters fear that, if such claims were allowed, it would greatly prejudice the subrogation rights of the insurance companies. They feel there could be no effective reply to the possible objection of the German Government that as the assured had already received back their war risk premiums there was nothing due the underwriters, in view of the fact that they had accepted the risk at a rate acceptable at the time and so must have felt themselves properly reimbursed for the hazards involved. As a matter of fact, the second half of this argument is so strong that many underwriters seriously question the wisdom of they themselves undertaking to lodge claims for war risk losses against Germany. The whole subject is as applicable to the insurance interests of ship owners and ship operators as to those of the merchants who have been making such an ado over it.

Lake Cover Extensions

NAVIGATION on the Great Lakes closed on December 12, but by special arrangement insurance coverage was extended somewhat beyond that date this season. The move originated in London where additional periods of coverage were allowed to certain Canadian fleets in consideration of an extra premium of one-half of one percent. American underwriters felt that this was an unfair advantage to the Canadians, and a special committee of the American lake underwriters decided to make a like charge for an additional period of three days, from midnight of December 12 to midnight of December 15, with the intimation that a further extension might be made if it should appear desirable. But they later decided to go no further than the 15th, and it is probable that the attitude of the Great Lakes Protective Association had a great deal to do with this determination. The Advisory Committee of the latter body held a special meeting on the subject and unanimously disapproved of any extension whatever; however, they reluctantly concluded to "follow the regular underwriters up to midnight of December 15th," but positively refused to go beyond that date.

The Association represents about three-quarters of the cargo tonnage of the Great Lakes, and they carry 25 percent of their own insurance. The more conservative members always lay up their vessels after December 12, and that element naturally was averse to taking chances for the benefit of the more reckless minority. When their decision was made known to the underwriters all talk of further unrestricted sailings ceased forthwith. It might be added that there is always a dangerous come-back to chance-taking with post-season storms. Last year underwriters felt jubilant over their lake experience in mid-December, only to see most of their profit melt away under the influence of subsequent reverses. Thus this year, after a fairly successful season, tremendous drain on the profits was had in consequence of heavy lighter losses sustained in the period of two weeks.

Refund of Ship Repairs Duties

UNDERWRITERS are somewhat anxious and considerably at sea over the problems involved in the insurance liability for the 50 percent ad valorem duty provided for in the new tariff act on repairs made abroad to American ships. Evidently the same question has perplexed London, for the Institute of London Underwriters has written to the Board of Underwriters of New York asking for the comments of American underwriters on the subject, and particularly as to whether the 50 percent duty would be claimable under hull policies. A committee of the New York Board is co-operating with Manager L. J. Brengle, representing the American Marine Insurance Syndicates, in securing legal advice on this question. The lawyers are now engaged in the preparation of their opinion.

There are two sections of the new tariff which have given rise to the discussion—Section 3114 and Section 3115. Underwriters feel that the language is ambiguous, and that there will have to be definite Treasury rulings before insurers or ship owners can determine to what extent duty is payable. They want to know just what is intended by the term "stress of weather or other casualty." Again, the act appears to limit refund of duty to cases where the vessel has *put into* a foreign port, but does not make mention of accidents *while at* a foreign port. Further, the act provides that duty is refunded on such repairs as are necessary to secure the *safety of the vessel to enable her to reach her port of destination*. Hence the query, what of the case where a vessel is able to reach her port of destination abroad, but must make repairs to enable her to complete her return passage? In such instances will our Government refund on all repairs made necessary to complete a return passage with cargo? Again, what is the proper meaning of the term "destination"?

In early December certain amendments were promulgated by an Assistant Secretary of the Treasury, but these were merely to elucidate customs procedure and in the nature of instructions as to methods to follow; underwriters dismiss them as throwing no light upon the problems above outlined, and await the advice of their counsel and pertinent Treasury rulings.

Negligence Voids General Average

THERE is no application of the doctrine of general average when the necessity for the sacrifice was caused by the negligence of the master or the crew. Such is the decision made in the *Mary F. Barrett* case, 270 Fed. Rep. 618. Before the Harter Act was passed ship owners were unable by contract to relieve themselves of liability for such negligence. That act exempts vessels from liability for losses due to errors of navigation, but does not entitle them to general average contributions for losses resultant therefrom.

If there is no stipulation in the charter-party entitling the ship to general average contributions on this account, a stipulation authorized under the Harter Act, the vessel cannot, on a libel for part of the cargo jettisoned because of the stranding of the ship resultant from errors of navigation, interpose the right to general average as a defense *pro tanto*.

Buffalo Lay-ups

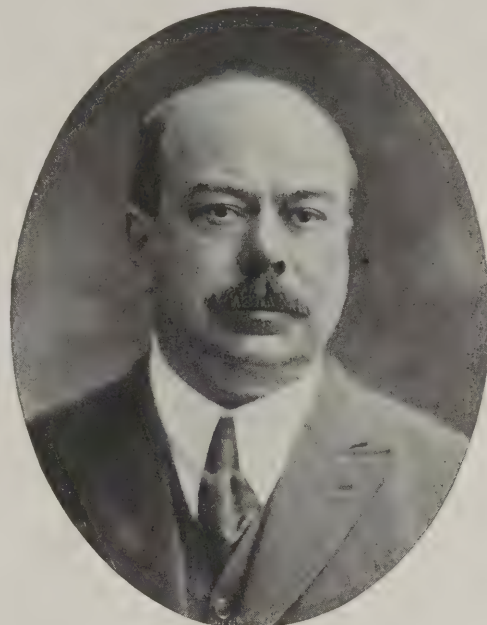
BECAUSE of the serious losses sustained by the breaking of the Buffalo breakwater last winter, underwriters have disapproved of that port for the laying up of vessels and have imposed an added three-quarters of one percent for coverage there. The Great Lakes Protective Association has taken this very much to heart and has pronounced it unjustifiable. They object to the dictum of the insurers that the berths be limited to fifty-five, and urge a further extension of the mooring space. They also ask that if this additional premium must be paid it should be on a pro rata basis with a minimum lay-up of fifteen days. Otherwise, they insist, no differential exists as between a season lay-up and one for a week.

The Maritime Association of the Port of New York to Celebrate Fiftieth Anniversary On February 5

THE Maritime Association of the Port of New York will celebrate its fiftieth anniversary with a banquet at the Hotel Astor on February 5. This body today is one of the most powerful organizations in the shipping industry in the Western Hemisphere.

For some years prior to 1872, a number of merchants interested in shipping congregated at the corner of William,

The rooms of the new organization, owing to its increased membership, soon became inadequate and an agreement was made with the Merchants' Exchange and News Association to rent for three years, from May 1, 1874, to May 1, 1877, the ground floor of 66 Beaver street, running through the

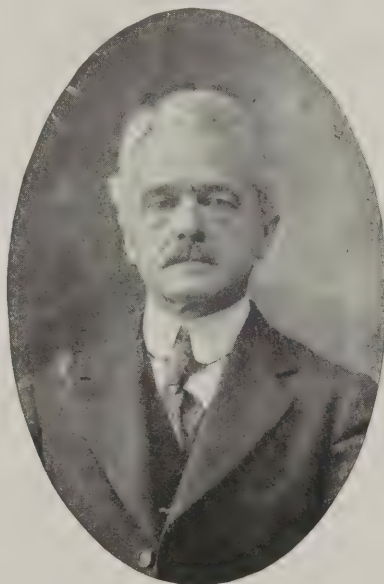


C. H. Potter, President

Produce Exchange. On May 1, 1875, the Maritime Association purchased the stock of the Merchants' Exchange and News Association and the membership was increased to 1,000.



John Dowd, Vice-President



W. F. Firth, Secretary



A. M. Campbell, Treasurer

South William and Beaver streets (sometimes called the downtown "Five Points"). In the latter part of 1872 it was suggested that a room be engaged in that vicinity. The idea met with very favorable response, and within two weeks, ending January 16, 1873, 140 firms had signed their names to the subscription list to defray the expenses of the new enterprise. The Maritime Association of the Port of New York was then formally organized and rooms engaged at 61 Beaver street, the formal opening being held on February 5, 1873, at 3 p. m.

In 1903 negotiations were made to purchase the property at 78-80 Broad street which proved successful and on January 5, 1904, the formal opening of the new quarters was celebrated by the first banquet of the association, which was held on the floor of the exchange.

On April 25 of this year the list of membership was raised from 1,200 to 1,500 to further increase the scope of the organization by additional members in the fast growing field of shipping. There are at the present time 127 shipping and allied trades represented in its membership.

Shipbuilding in the United States in 1922

Private American Shipyards Delivered 303,433 Tons of Shipping Last Year—503,238 Tons Now Under Construction

ADVERSE financial and business conditions abroad, coupled with the Naval Disarmament program entered upon in 1922, have wrought havoc in the activities of American shipyards during the last year and their output of vessel tonnage has dropped to the average of pre-war years when their facilities for building ships were far less extensive than they are now.

During the year just ended, private American shipyards turned out a total of 256 vessels of over 100 gross tons each, aggregating 303,433 tons. Of this output, 230 were merchant vessels of 282,938 gross tons and 26 were naval vessels of 20,495 tons. The output of the individual yards is shown in the table on the opposite page.

Of the tonnage built, approximately 67 percent was turned out on the Atlantic and Gulf coasts, 11 percent on the Pacific coast, 8 percent on the Great Lakes and 14 percent in the Mississippi Valley, as follows:

Distribution of Shipbuilding in 1922

District	Tonnage	Percent
Atlantic and Gulf Coasts.....	204,257	67.3
Pacific Coast	33,143	11.0
Great Lakes	23,223	7.7
Mississippi Valley	42,810	14.0
Total	303,433	100.0

TONNAGE NOW UNDER CONSTRUCTION

The volume of tonnage now under construction in private American shipyards aggregates 503,238 tons, of which 233,096 tons are merchant vessels of over 100 gross tons each and 270,792 tons are naval vessels. Approximately 65 percent of the work now in hand is being built on the Atlantic and Gulf coasts, 11 percent on the Pacific coast, 14 percent on the Great Lakes and 10 percent in the Mississippi Valley, the tonnage being distributed as follows:

Distribution of Shipbuilding on January 1, 1923

District	Tonnage	Percent
Atlantic and Gulf Coasts	328,315	65.0
Pacific Coast	56,224	11.2
Great Lakes	69,250	13.8
Mississippi Valley	49,449	10.0
Total	503,238	100.0

As compared with the present volume of tonnage under construction, there were building in private American shipyards a year ago 792,976 tons of shipping, comprising 322,680 tons of merchant vessels and 460,296 tons of naval vessels.

LEADING SHIPYARDS

Considering the volume of output of the individual shipbuilding companies, the leading position last year was held by the Bethlehem Shipbuilding Corporation, Ltd., with a total output of 126,242 tons of both merchant and naval vessels. The New York Shipbuilding Corporation was second with an output of 32,622 tons comprised wholly of merchant vessels.

This year the Bethlehem yards again lead with a total of 155,092 tons of vessels under construction and the New York Shipbuilding Corporation is second with a total of 80,132 tons. In both cases the work includes both merchant and naval construction, the various yards of the Bethlehem Shipbuilding Corporation, Ltd., having 41,700 gross tons

of merchant vessels under way and 113,392 tons of naval vessels while the New York Shipbuilding Corporation has 12,132 tons of merchant vessels under construction and 68,000 tons of naval vessels.

Considering merchant vessels only, the American Shipbuilding Company on the Great Lakes is in the lead with a total of 46,200 gross tons under construction as against the Bethlehem yards with 41,700 tons of merchant work. The company with the third largest volume of vessel tonnage under construction is the American Bridge Company, which is building 34,180 gross tons of barges.

CONTRACTS PLACED IN 1922

Over \$32,500,000 worth of new vessel construction was placed in American shipyards during 1922, according to data compiled from the records published in our columns from month to month. In the list of new steamship contracts, the most important placed during the year included two passenger steamers for the Cleveland and Buffalo Transit Company to cost approximately \$6,000,000; three freight ships for Great Lakes service, \$2,400,000; four Diesel electric dredges for the United States Government, \$2,528,240; two passenger ships for the Seaboard-Day Line, \$2,000,000; two passenger ships for the Savannah Line, \$1,840,000; two passenger ships for the Merchants and Miners Line, \$1,700,000; three ferries for the city of New York, \$1,589,900; a new steamship for the Inter-Island Steam Navigation Company, \$1,027,000; two ships for the United States Steel Products Company, \$1,000,000 and a new steamer for the Pacific Cable Company, \$1,000,000.

In addition to new vessel construction, American shipyards received contracts during 1922 for nearly as much vessel reconditioning work. A total of more than \$84,981,517 worth of vessel construction and reconditioning work in contemplation was reported in our columns during the year and over \$50,242,824 in contracts placed for similar work.

PROSPECTS FOR 1923

Unmistakable signs indicate that the year 1922 marks the low point in shipbuilding in the United States and that 1923 will produce a considerably larger amount of construction. Among the first contracts to be placed with American shipbuilders in 1923 are those for two passenger ships for the Eastern Steamship Company at a cost estimated at \$4,000,000; a new passenger and freight ship for the New York and Porto Rico Line, \$1,500,000; and a new passenger and freight ship for the Clyde Line which is expected to cost in excess of \$1,000,000. From present indications the contracts for these vessels will be placed during the first half of the new year.

In addition to this new construction work, which at the present time seems practically assured if present plans are carried out, \$6,500,000 worth of ship reconditioning work, involving the steamships *Agamemnon*, *Mount Vernon*, *President Grant* and *America*, will also be in the hands of American shipbuilders during the early part of 1923. It is also evident that 1923 will bring forth not only additional sea-going vessels but river and harbor craft as well, there being a strong tendency in those localities requiring shallow draft steamers to dispense with wooden vessels in favor of steel.

TWO DIESEL LIGHTSHIPS PLANNED

The construction of two lightships propelled by Diesel

American Shipbuilding Returns for 1922

Shipyard	Merchant Vessels Completed in 1922			Naval Vessels Completed in Private Yards in 1922			Merchant Vessels Now Under Construction			Naval Vessels Now Under Construction in Private Yards		
	Number of Ships	Total Gross Tonnage	Total Horsepower	Number of Ships	Total Displ. Tonnage	Total Horsepower	Number of Ships	Total Gross Tonnage	Total Horsepower	Number of Ships	Total Displ. Tonnage	Total Horsepower
American Bridge Company.....	52	18,380	2,400	.....	.....	.....	.....	.....	.....	.....	.....	.....
American Shipbuilding Company.....	1	8,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Balford Marine Railway Company.....	4	2,800	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bath Iron Works, Ltd.....	2	1,250	800	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bethlehem Shipbuilding Corporation, Ltd.....	14	112,326	53,350	16	13,916	2,100	.....	.....	.....	18	113,392	420,000
Consolidated Shipbuilding Corporation.....	.....	.....	.....	3	2,575	1,800	.....	.....	.....	.....	.....	.....
Wm. Cramp & Sons Ship & Engine Building Company.....	3	2,046	.....	.....	.....	.....	.....	.....	.....	5	35,500	450,000
Defoe Boat & Motor Works.....	50	10,802	160	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dravo Contracting Company.....	2	800	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dubuque Boat & Boiler Works.....	3	950	800	3	.....	.....	.....	.....	.....	.....	.....	.....
John Eichleay, Jr., Company.....	2	11,380	3,100	.....	.....	.....	.....	.....	.....	.....	.....	.....
Federal Shipbuilding Company.....	6	8,299	1,200	.....	.....	.....	.....	.....	.....	.....	.....	.....
Great Lakes Engineering Works.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Great Lakes Towing Company.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Howard Shipyard Company.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Humphreys R. K., Inc.....	1	350	300	.....	.....	.....	.....	.....	.....	.....	.....	.....
Johnson Dry Docks & Shipbuilding Company, Inc.....	5	1,344	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
J. C. Johnson.....	2	1,335	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Johnson Shipyard Corporation.....	2	5,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kelley Spear Company.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kyle & Purdy, Inc.....	2	315	320	4	4,004	7,200	.....	.....	.....	.....	.....	.....
Lake Torpedo Boat Company.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Los Angeles Shipbuilding & Dry Dock Company.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Main Iron Works.....	1	1,000	1,000	.....	.....	.....	.....	.....	.....	.....	.....	.....
Manitowoc Shipbuilding Corporation.....	2	5,347	1,500	.....	.....	.....	.....	.....	.....	.....	.....	.....
Martette Manufacturing Company.....	7	1,950	400	.....	.....	.....	.....	.....	.....	.....	.....	.....
Merchant Shipbuilding Corporation.....	3	16,091	9,800	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nashville Bridge Company.....	17	6,100	435	.....	.....	.....	.....	.....	.....	.....	.....	.....
Newport News Shipbuilding & Dry Dock Company.....	2	1,608	1,800	.....	.....	.....	.....	.....	.....	.....	.....	.....
New York Shipbuilding Corporation.....	10	32,622	21,750	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pusey & Jones Company.....	3	3,568	6,500	.....	.....	.....	.....	.....	.....	.....	.....	.....
Jas. Rees & Sons Company.....	2	700	500	.....	.....	.....	.....	.....	.....	.....	.....	.....
Staten Island Shipbuilding Company.....	4	5,802	6,100	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sun Shipbuilding Company.....	11	17,946	9,600	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tebbo Yacht Basin.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Todd Dry Dock & Construction Company.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Toledo Shipbuilding Company.....	1	677	1,200	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union Construction Company.....	1	1,010	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vinward Shipbuilding Company.....	3	512	728	.....	.....	.....	.....	.....	.....	.....	.....	.....
Charles Ward Engineering Works.....	4	3,238	4,100	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	230	282,938	130,193	26	20,495	9,800	221	232,446	116,050	29	270,792	1,378,600

engines and equipped throughout with electrically-driven auxiliaries is contemplated by the Bureau of Lighthouses of the Department of Commerce, Washington, D. C.

According to the annual report of the Commissioner of Lighthouses to the Secretary of Commerce the increasing need of additions to the vessels of the Lighthouse Service will involve an expenditure of approximately \$3,260,000 during the next three years for new vessel construction and appropriations for a part of this program will be requested at once.

VESSELS FOR WESTERN RIVERS

Appropriations, totaling approximately \$1,000,000, are expected to be available for work in the Mobile district of the War Department during 1923. The Engineer Office in that district has under construction at the present time a 100-foot Diesel electric stern wheel tug with steel hull having a length overall of 119 feet, beam, molded, 23 feet and depth, 5 feet. The contract for the construction of this vessel was recently awarded to the Charles Ward Engineering Works, Charleston, W. Va., for a total of \$89,000. The same office has also recently placed contracts for the construction of 62 hydraulic pontoons at a total cost of \$22,568 and expects to advertise for bids during the early part of 1923 for the construction of 7 steel barges, 100 feet by 25 feet by 5 feet and has plans under course of preparation for a steel derrick boat.

MOTORSHIPS CONTEMPLATED

The Atlantic and Western Steamship Company, commonly known as the Nawsco Line, which is engaged in coastwise service between the Atlantic and Pacific coast ports of the United States, contemplates the purchase of vessels from the Shipping Board for conversion to Diesel propulsion.

The Rochester Terminal and Canal Corporation, Rochester, N. Y., it is understood, is planning the construction of new barges and the conversion of coal burning tugs to either oil burning or Diesel equipment.

The United States Engineer Office, Portland, Ore., contemplates the construction of two steel dump scows, each 70 feet long, 22 feet wide and 6 feet deep, and the Engineer Office, Jacksonville, Fla., is planning to construct three steel barges, each 80 feet by 26 feet by 5 feet, and a motor dredge tender.

It is learned that the Port Huron and Sarnia Ferry Company, Port Huron, Mich., contemplates the purchase of a boat with a capacity of from 750 to 1,000 passengers for ferry service, to be ready for operation in the spring.

While there is a possibility that S. Sgitovich & Company, steamship agents and operators, at Galveston, Tex., may acquire ocean tonnage in the near future, definite action has not yet been decided upon.

The Goodrich Transit Company, Chicago, Ill., while having no definite building program in view for new vessels, is considerably interested in fuel oil burning. Several passenger vessels on the Great Lakes are being converted from coal to oil this winter and the Goodrich Company will probably watch with interest the results of these conversions.

British Shipping and Shipbuilding in 1922

**Obsolete Tonnage Greater Than Most People Believe
—Rush of New Contracts in Final Quarter Significant
That Trade Improvement Will Increase Building Costs**

By W. H. Wendon

SHIPOWNERS and shipbuilders of the United Kingdom enter 1923 with measurably more hope in their minds than when they embarked on the year through which we have just passed. 1922 started badly, and retained a deplorable slumpiness for the greater part of its natural course, but fortunately towards the close of the year a brighter aspect ruled—hence the feeling of better times in store in the not too distant future. Not that *all* owners and builders hold this view; on the contrary, there are some who see nothing but gloom in the year which lies before us. What has given rise, more than anything else, to the conflicting opinions which now obtain in shipping circles is the advisability or otherwise of certain owners who have deemed it expedient to contract for new vessels.

These new contracts—so conspicuously few in the earlier months—came with somewhat of a rush in the final quarter. The owners were apparently uninfluenced by the still enormous quantity of steamship tonnage laid up in various parts of the world (the amount of merchant shipping laid up all over the world is estimated at round about ten million tons gross) and the fact that rates of freight remain on an unremunerative level.

Some shipbuilders are willing to accept as low as £8 10s. per ton deadweight for a steamer to carry 8,000 tons, and with delivery about June, 1923. Several contracts have, in fact, been placed at between £8 10s. and £8 15s. per ton—prices which will mean a substantial loss to the shipbuilders. The view of shipowners who are thus contracting would seem to be that as, apparently, prices have reached bottom—at all events for the time being—it is advisable to order vessels in the hope that by the time the boats are constructed the general position will have improved.

BUILDING COSTS WILL NOT GO LOWER

The views of one shipowner of many years' experience in the placing of contracts are not devoid of interest. He states that, while, compared with pre-war prices, the present cost of building seems very large, being about thirty percent above pre-war, he does not see how values can fall to anything like those existing in 1914, owing to the cost of coal, increased railway rates, extra wages, etc. This shipowner describes the position of the Continent as "about as bad as it can be," and that any change must be for the better. Europe, he points out, still wants a mass of material of one description or another, and, once its inhabitants are in the position of getting to work on pre-war lines, trade will improve. He places against the amount of the laid-up tonnage in the world the obsolete tonnage, which, he considers, is greater than most people realize.

Then there enters into the question the highly important matter of the future of the Diesel-engined vessel. Shipowners as a body are now convinced that the ship of the future is the motorship. Probably it only requires one or two owners to be successful with the operation of internal combustion engined vessels for the rest of shipowners to lay down similar boats, but in the meantime there is—perhaps not unnaturally—a marked reluctance on the part of shipowners to act as "pioneers" in this matter. They *feel*, as I have indicated, that the future of the motorship is assured, but beyond that they are not prepared to go. It is considered that developments in Diesel ships will enable owners to

earn dividends even at current freight rates, which show a loss when accepted by the older boats, but shipowners as a body have reached the decision that before contracting, it is their duty to themselves and their shareholders to inquire closely into the working costs of such boats as compared with vessels already in their lines. Several of the leading owners, however, have given it as their intention, if the figures are satisfactory, to build one Diesel boat to test its efficiency, notwithstanding that the cost of the job may be as much as forty percent above that of a boat fitted with triple expansion engines.

RAPID GROWTH OF OIL BURNERS

The annual report of Lloyds' Register of Shipping, issued towards the close of 1922, gave striking confirmation of the revolutionary change which took place in marine bunkering methods during the year and its immediate predecessors, more than half—55 percent, to be exact—of the total tonnage of new vessels classed during the year ending June 30 being fitted for burning oil fuel. The rapidity with which the change has come about may be judged from statistics of tonnage equipped for oil burning on July 1, 1914, and last July respectively, the pre-war total being only 1,310,209 tons gross, whereas by July, 1922, this had grown to the enormous figure of 14,464,162 tons—or more than ten times the figure of eight years ago.

In closing my remarks on this particular phase of shipping and shipbuilding activity during the past year, I may, perhaps, be pardoned for placing on record the views on this subject of no less an expert than Sir Charles Greenway, Bart., the chairman of the Anglo-Persian Oil Company, Limited, who is of opinion that "the substitution of oil for coal is an important step towards the conservation of the world's supplies of the latter product, and, though burning oil beneath boilers is not the most economic, nor, therefore, the most desirable method of utilizing the energy contained in the fuel, this method has at least the argument in its favor that the fuel oil is a residual product left after the more valuable fractions have been extracted, whereas with coal a whole series of by-products as well as a considerable portion of its thermal efficiency are being wasted when used in its present state. It is gratifying, however, to see the strides that have been made within recent years towards the economic utilization of oil as a fuel by means of the introduction of the internal combustion engine, the increased adoption of which is shown by the fact that there were 1,620 motor vessels of an aggregate tonnage of 1,542,160 at July last, as against 297 vessels aggregating 234,287 tons in July, 1914."

BUILDING VESSELS ON SPECULATION

Another outstanding feature of the past year has been the attempt which has been made at various times to induce shipbuilders to construct steamers on "spec.," that is to say, the builders were to lay down the vessels on the off-chance that, when the boats were ready for delivery, the general position would have improved, thus enabling the builders, by persuading shipowners to acquire the boats, to realize for themselves a profit, however small, as a reward for their enterprise. Contrary to pre-war experience, when this method of transacting business was considered, more or less, to be

the proper one, shipbuilders nowadays show something amounting to keen disinclination to enter into such commitments. Not in every instance, it is true, for Messrs. Swan, Hunter and Wigham Richardson, whose magnitude as ship constructors may be gaged from the fact that during 1921 they launched no fewer than fourteen vessels aggregating 92,315 tons gross, and the even more imposing figure of 109,932 tons in the preceding year, have decided to take the risk of building, at their Wallsend yard, two vessels for their own account. They hope for such co-operation of the employees, by putting in good and energetic work, as will reduce the risk of loss, and encourage further similar experiments.

PRE-WAR WAGE SCHEME FAILS

Most important of all in the matter of projected "spec." contracts, however, was in the case of Messrs. Lithgows, of Port Glasgow, who, in the late summer, offered to lay down four cargo steamers on "spec.," provided the workers agreed to accept pre-war wages, plus any bonuses to which they were entitled. Messrs. Lithgows were obviously taking a considerable risk, for, even with steel down to a new level, and wages at pre-war rates, the boats would cost more to construct than shipowners might be disposed to pay for them in the open market. The matter did not proceed very far, however, for the employees, acting, apparently, under the fear that, if the offer were accepted, the position of their fellows elsewhere might be prejudiced, declined to fall in with the shipbuilders' scheme. The large financial risk which the employers were prepared to face carried no weight with the workmen or their trade unions, and the motion was lost to the hair-splitters.

Later in the year the suggestion came up again, when a Greenock municipal official suggested that, in order to relieve unemployment in the Scottish port, the local municipal corporation should accept responsibility for laying down three cargo steamers, of about 10,000 tons deadweight each, on the chance of somebody purchasing them either during construction or when completed. It was estimated that the adoption of the scheme would give employment to 1,800 men for at least six months, and would save the community about £34,000 in unemployment compensation. The suggestion fell on deaf ears until a Glasgow shipowning firm, stating that they contemplated the construction of three fruit-carrying steamers, expressed the desire to have the vessels built under the Corporation's scheme. Inasmuch as the plan failed to elicit marked approval on the part of the shipbuilders, it is felt that little or nothing will come of the project.

IDLE TONNAGE

There have been singular ups and downs in the figures of idle tonnage during the past year, but it may, perhaps with some justification, be taken as a good omen that, at the date of the last count, namely, October 1, there was an appreciable decline as compared with three months previously. The subjoined analysis of the tonnage laid up in the principal ports of the United Kingdom gives the position in a nutshell:

1921	No.	British Tons net.	No.	Foreign Tons net.	No.	Total Tons net.
July 25	883	1,650,788	140	201,624	1,023	1,852,412
October 25 ..	654	1,158,425	88	137,811	742	1,296,236
1922						
January 1 ...	621	1,179,548	91	128,045	712	1,307,593
April 1	422	734,240	62	102,379	484	836,619
July 1	533	1,025,662	50	86,670	583	1,112,332
October 1 ...	419	752,469	37	72,155	456	824,624

These figures, it will be noted, are all in *net* tonnage, so that about 60 percent should be added to arrive at the gross register tonnage. The table shows that on October 1 the amount of tonnage lying idle in the principal United King-

dom ports was 287,710 tons net (representing 127 vessels) lower than at July 1.

FREIGHT RATES

Closely allied to laid-up tonnage statistics are those concerning freight rates, and the fluctuations which have taken place in voyage freights and time charter freights in the last two years are interesting, 100 being taken as representing the rate in 1920. In this connection the following are vouched for by the Chamber of Shipping of the United Kingdom:

1921	Freights	Time charter
January	46.3	59.8
February	38.0	41.8
March	37.5	39.8
April	39.5	39.5
May	39.4	37.4
June	42.7	36.6
July	43.0	34.7
August	40.2	34.7
September	34.4	33.9
October	30.8	29.9
November	29.8	29.9
December	33.3	29.9
1922		
January	33.0	29.9
February	33.6	29.9
March	33.3	29.9
April	31.0	28.4
May	32.5	26.9
June	29.8	26.1
July	27.8	35.4
August	27.6	25.4
September	26.7	25.4
October	28.1	23.9

It will be observed that in October, the latest month for which complete data are available, freights moved up nearly two points as compared with the preceding month, but that the time charter rate had a disastrous setback at 23.9, as against 25.4 in each of the two preceding months. It would, indeed, be necessary to go back practically to pre-war days to run across a time charter as low as that current last October. Comparison of the 23.9 of October with the 59.8 of January, 1921, indicates very clearly the fall which has taken place.

REGULATIONS FOR DISCHARGING OIL

1922 saw a great step in the right direction *apropos* the discharging of oil and oily waste in docks and harbors. After a prolonged period of negotiation a scheme was at last put on foot, with the result that, as from January 1, 1923, it is unlawful under the "Oil in Navigable Waters Act" to discharge oil and oily waste from vessels in territorial waters, the aim of the measure, of course, being to put a stop to the danger to dock and shipping property arising from such discharge. These regulations were published in full in the November, 1922, issue of MARINE ENGINEERING AND SHIPPING AGE.

PORT CHARGES

While shipowners and port authorities have had a measure of unanimity on one matter, it cannot be said that their views coincide in relation to another. They are, in fact, a long way from seeing eye to eye on the question of port charges, and during the year through which we have just passed the arguments at times have been, perhaps, more pointed than polite. The various port authorities have made substantial reductions in their charges, but still not to the requirements of the shipping community, who see in port costs the biggest bill in which a cut should be made. There is certainly some justification for their contention that, while freight rates have slumped enormously, port rates in many instances remain at least double the pre-war figure.

Port authorities, however, are determined, if at all possible, to adhere to their present charges, and have applied

to the Ministry of Transport for permission to continue the existing increased charging powers. The history of these powers is of more than usual interest, in that it shows what may result from the institution of so-called "temporary" measures. Briefly, then, the powers were conferred by the Harbors, Docks and Piers (Temporary Increase of Charges) Acts, 1920-22. Shipowners and traders generally have now the right to object to the continuance of these higher charges, and, where such objections are made, the Minister of Transport must refer them to the Rates Advisory Committee, before which the objectors have a right to be heard. Thus it rests with those engaged in the shipping industry to take action, as otherwise it might be assumed that the application of the dock and harbor authorities would meet with the sanction of the Ministry of Transport.

In September, 1920, the Minister of Transport directed railway companies to increase the charges at their docks by 150 percent above the pre-war rate, the object being to prevent any further losses to the taxpayer during the period of Government control. On the de-control of the railways in August, 1921, the companies were permitted to continue the increased charges until February, 1923. In the case of the non-railway-owned docks, orders were made at various dates by the Ministry of Transport under the Act permitting them to make increased charges. These orders also were terminable in February, 1923.

In the last session of Parliament the Minister of Transport introduced a bill to continue the Harbors, Docks and Piers (Temporary Increases of Charges) Acts until February, 1925, but this Bill was amended, with the result that the Act of 1922 empowered the Ministry of Transport to continue the increased charging powers for both classes of docks only until February, 1924, with the proviso that shipowners and other parties interested should, as I have pointed out, have the right to object to such orders being made. There is ample evidence, therefore, that, unless the port authorities are induced to change their minds in the matter of charges, there will be some lively exchanges of opinion between the authorities and their shipping clients.

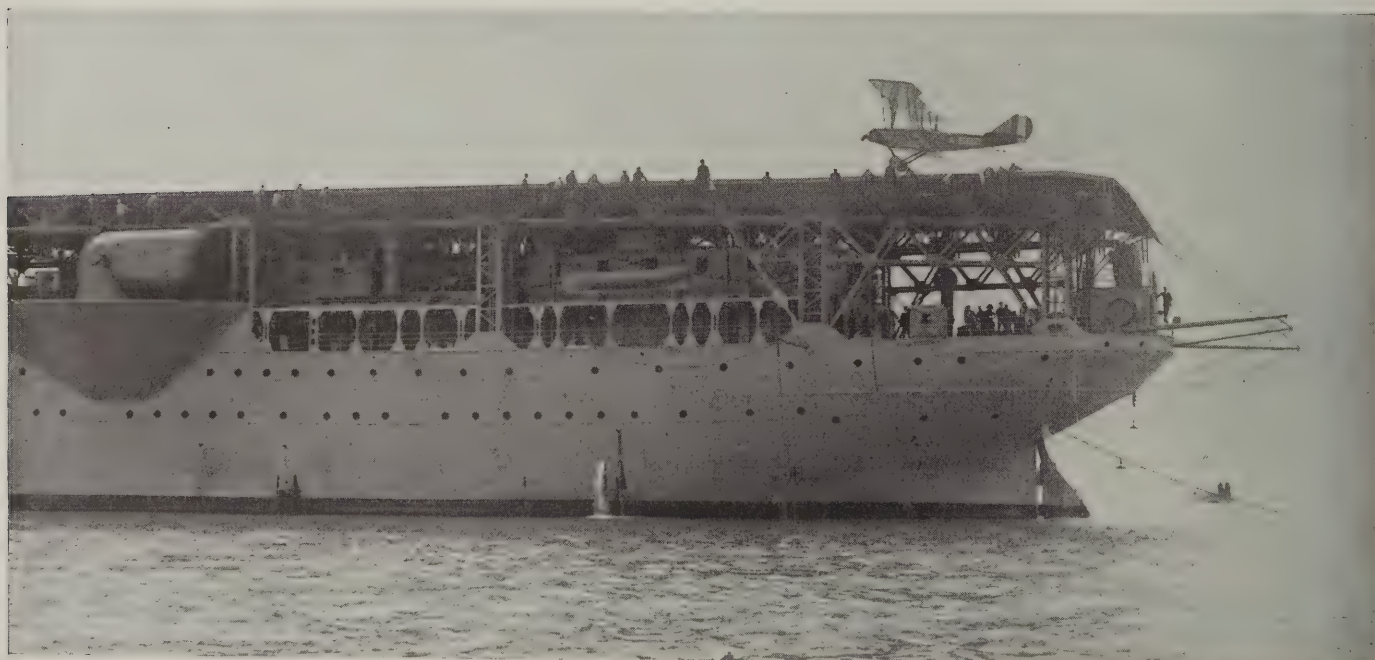
The battle for the title of "Premier Port of the United

Kingdom"—if not of the world—has been carried a stage further than could be recorded this time last year, for in the intervening period London, Liverpool and Southampton have wrestled with each other in an endeavor to secure pride of place. But the main issue, so far as mammoth dock construction is concerned, would seem to lie between Liverpool and Southampton—the former in respect of its Gladstone Dock, which is undergoing extension and improvement to enable the largest vessels in the world to find accommodation, and Southampton in regard to the huge floating dry dock, the contract for which was placed with Sir W. G. Armstrong, Whitworth and Company, Ltd., Newcastle, late in the past year.

The London and South Western Railway Company, who handle the shipping traffic at Southampton, reached their decision to build the dock in June last, and the dock is intended to accommodate the largest Transatlantic liners, including the *Majestic*, *Berengaria*, *Aquitania* and *Mauretania*. Every effort will be made to put the dock in commission before the close of 1923.

Increased capitals and reduced dividends have been the outstanding features of shipping companies' balance-sheets. Many millions sterling have been subscribed by all and sundry at the invitation of shipping companies—principally the larger liner concerns—the sums being needed, in the majority of instances, to enable the companies to pay for boats contracted for when prices were high.

In conclusion, while the shipping and shipbuilding companies of the United Kingdom experienced in 1922 a lean time, they are certainly not worse off than some of their Continental competitors, whose troubles have also been great. Exception may, perhaps, be made in the case of Germany, but so far as that country is concerned, everything in a business way is purely artificial. The "value" (save the mark) of the mark has placed German builders, owners, repairers and breakers in an advantageous position as compared with those in other countries, but, on the other hand, the domestic calls have been heavy, and it must be solely a matter for conjecture as to the *real* benefit, if any, which has accrued to German business men.



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First Landing of Land Plane on Deck of United States Warship

In successful naval maneuvers held recently aboard the U. S. S. *Langley* in the York River, Virginia, a land-type plane for the first time landed successfully on the deck of a United States warship. Lieutenant Commander Godfrey DeC. Chevalier, flying the two-seater A-606, landed on the flight deck of the U. S. S. *Langley* while the vessel was proceeding at a speed of about six knots.

The Situation in German Shipyards

**Shipowners Prevented from Placing Contracts
by Depreciation of Currency Which Makes It
Impossible to Estimate Cost of New Vessels**

By K. Trautner

THE general slump in shipbuilding throughout the world has begun to make itself felt in German shipyards which until a few months ago were still sufficiently busy. The reason for this situation is to be found in the fact that the indemnities that the Federal Government had to pay to shipowners by way of compensation for merchant ships seized and delivered to the Entente have been for the most part used up and so far no further grants have been allowed due to the government being overburdened with reparation payments.

In foreign papers the opinion has been expressed of late that the Federal Government is supporting shipowners by means of high subsidies, thereby enabling them to rebuild a large merchant fleet in a comparatively short time. This, however, is not the case; it was merely a matter of indemnities, to which shipowners had an equitable right for the ships that had been taken from them. Furthermore, the sums paid were so extremely small that only a very small fraction of the 1914 tonnage could be rebuilt. Most of these replacement ships are already in operation and the balance is going to be ready within a comparatively short time.

POSSIBILITIES FOR NEW CONTRACTS

As to the securing of further shipbuilding contracts, great difficulties lie in the way of the shipyards. In particular it is thoroughly impossible in view of the daily repetition of further slumps in the value of German currency to make any safe reckoning and to submit firm offers for the building of new ships. The shipyard is therefore unable to give to the shipowner the slightest information as to the final cost of his new ship and this insecurity makes it impossible for most shipowners to place shipbuilding contracts unless they are to be paid for out of indemnities paid by the Federal Government.

Furthermore, the financial situation of practically all German shipowners has been so seriously impaired by the war that many of them were compelled to meet their most urgent requirements by refitting old ships or by making purchases abroad. It is therefore seen that the future prospects of the German shipbuilding industry are not particularly promising.

The river shipbuilding yards are still partly busy on reparation building for the Entente. This building consists mainly in river tugs and freight barges for the Rhine and the Elbe and also for the Danube.

A special type of river tow barges, many hundreds of which are to be delivered to France and to Belgium by way of reparation, consists in a type of barge having the following measurements:

Length between perpendiculars	About 124 feet 8 inches
Molded depth	About 16 feet 5 inches
Beam	About 7 feet 6 inches
Displacement	450 tons
Draft	About 7 feet 3 inches

These vessels are provided with living quarters astern and with cargo space forward. At the bow there is fitted up a small iron warping winch with 4 warping ends and amidships there is a portable mast.

FOREIGN CONTRACTS AT HAMBURG

Among German shipyards the Deutsche Werft of Hamburg alone can boast at the present time of having succeeded in

securing some large contracts from abroad. These contracts are the following: 2 Diesel motorships of 21,000 tons dead-weight each, ordered by the Swedish shipping firm of Broe-stroom of Gothenburg, and, furthermore, 2 Diesel motorships of 6,000 tons each for another Swedish company. Another Hamburg shipyard is negotiating for the building of a large freight and passenger ship which is to be built for Italy on reparation account.

SHIPBREAKING

Several other shipyards have taken up as a side line to procure work, the demolition of old or uncompleted war vessels, both domestic and foreign. Among these old war vessels particular mention should be made of the Russian armored cruiser *Askold*, of 24 knots speed and 6,100 tons displacement. This ship, distinguished by its five funnels, was one of the few vessels that was able to reach a neutral port after the battle before Port Arthur had been lost in the Russo-Japanese war.



(Photograph by Kadel & Herbert, N. Y.)

Germans Salvaging Ships Sunk Ten Years Ago for Their Iron and Metal

Due to the scarcity of iron and metal in Germany, concerns are now raising old ships that were sunk years ago to get the iron and metals. The above photograph shows the huge derrick pulling up the hull of a ship sunk ten years ago in the Kiel Canal.

FORMER NAVY YARDS CONSTRUCTING AUXILIARIES

The former Imperial shipyards of Kiel and Wilhelmshaven are engaged, aside from shipbuilding, in the construction of auxiliary engines, motors, stationary engines, etc.

While until a few months ago many foreign shipowners had their ships dry-docked in German ports, this work has likewise experienced a heavy decline, due to prices in Germany having risen so high of late that many foreign ships find it cheaper to use their domestic rather than German dry docks. Many docks, therefore, remain empty.

Considering all circumstances, German shipyards are looking forward to a dark winter. On the one hand wholesale dismissals of workmen and employees are threatened and on the other hand exorbitant increases in the prices of food, fuel and all the necessities of life, which have taken an enormous lead over salaries and wages.

New Cable Ship Marie Louise Mackay

THE *Marie Louise Mackay*, a twin screw telegraph cable repairing steamer which has been built and engined by Swan, Hunter & Wigham Richardson, Limited, at the Neptune Works, Newcastle-on-Tyne, for the Commercial Cable Company, Limited, of New York, has recently left the Tyne.

The steamer is built of steel, being about 245 feet in length by 34 feet in breadth by 24 feet 6 inches in depth.

the vessel. A large glazed shelter on the navigating bridge may be specially mentioned, where all on duty there are well protected from bad weather. The captain's accommodation is on the navigating bridge, while the rooms for the navigating and cable officers are on the awning and main decks amidships, including a very comfortable dining saloon amidships. The petty officers, cablemen and seamen are on the main deck aft.

The steamer is also fitted with an installation of wireless telegraphy, ample ventilation, steam heating, electric light and bells, telephones, etc. There is a refrigerated room aft for the ship's use, as well as ample storeroom accommodation.

The auxiliary machinery for navigating and working the vessel is of the most improved pattern, including a specially designed steam windlass forward and steam capstan aft, steam winch, steamboat hoist, steam steering gear, motorboat, etc.

PROPELLING MACHINERY

The propelling machinery, which has been constructed by Swan, Hunter & Wigham Richardson, Limited, at the Neptune Engine Works, Newcastle-on-Tyne, consists of twin screw triple expansion engines, supplied with steam from two boilers, working under Howden's system of forced draft, and fitted to burn oil fuel on the Wallsend-Howden system.

When the vessel was at sea for her trial trip, everything worked without the slightest hitch, giving entire satisfaction to all concerned, attaining a speed of 12 knots.



Cable Ship Marie Louise Mackay

She has three cable tanks for the carriage of the submarine cable, all placed forward of the propelling machinery and having a total coiling capacity of about 18,000 cubic feet and a hold forward arranged for the stowage of cable stores, etc. The machinery for working the cables has been supplied by the Telegraph Construction and Maintenance Company, Limited, and is of their latest design; it includes picking up and paying out gears, Lucas dynamometers and a Lucas patent sounding machine. Three large cable sheaves are fitted to the overhanging bow.

Arrangements have been made for the carriage of water ballast in both the fore and after peaks and in the double bottom, while the oil fuel is carried in a cross bunker and is of sufficient capacity for a cruise of 6,000 miles.

CREW ACCOMMODATIONS

The comfort of the staff on board has been the object of special consideration in designing the accommodations of

The vessel, which has been built under the supervision of Capt. F. H. Larnder, O.B.E., is the second cable steamer recently built at the Neptune Works for the Commercial Cable Company. The other, a much larger steamer, called the *John W. Mackay*, has made a very successful beginning to her career since her delivery to her owners early in June last year.

New Port Association Proposed

Frank S. Davis, manager of the Maritime Association, Boston Chamber of Commerce, has invited port organizations at the several North Atlantic ports to convene for the purpose of organizing a North Atlantic Ports Association. The meeting will probably be held in New York City in the near future, when the aims of the association will be disclosed and officers elected.

Efficiency in the Operation of Steamships

Analysis of Operating Costs Shows Where Economies Can Be Effected—Why American Ships Need A Subsidy

By Captain Daniel A. J. Sullivan†

SINCE the inception of transporting freight by means of water routes until the present time, there has been one important question which has caused more worry and deep study than any other, and that is the cost of operation. In the study of this subject one is impressed with the importance of every detail which added together makes the whole, so that in delving into the records of the past, those of us who are now striving to produce efficiency realize the necessity that each and every member of the profession should understand that his efforts and his labor are a part of the whole, and if the results of his labor are not up to the mark, then the whole will be handicapped by just that amount. So in the efficient operation of any ship, every person who has had a part in designing, in building and then in operating that ship is responsible for his part, and if each and every one has produced perfect results then the result as a whole should be perfect.

In theory this is true, but in practice we find too many "exceptional conditions," which expression has been used to cover a multitude of blunders in the past as well as in the present. So in the study of this subject we must admit to ourselves that each of us is responsible for the results attained, and that on the blunders of the past we can erect a perfect organization for successful operation.

The history of shipping reveals many interesting events, and without spending too much time on the past, it is well to recall that supremacy of the seas has gradually changed from nation to nation since the beginning of water transportation until the present, and will continue to be fought out on economic lines until the end of time. In studying the cause of the gain or loss of the supremacy of the seas, it appears to be true that the nation which can build ships for less than others, and whose vessels can transport cargoes faster and cheaper than others, will rule the sea. Here again enters the "exceptional condition" in the form of Government ownership and of Government subsidy.

At the time of writing this article, an effort is being made to place the merchant marine of the United States on an equal competitive basis with the merchant marine of other nations by the adoption of a ship subsidy. Those interested in the success of vessels under the American flag realize the necessity of this measure.

WHY A SHIP SUBSIDY IS NECESSARY

First, on account of the higher first cost of the vessels built in the United States.

Second, the American merchant marine is the only important American industry not protected by tariff.

Third, to equalize the present unfair competition on account of the subsidy paid to the merchant marine by other nations in competition with the merchant marine of the United States.

Fourth, on account of protection to other industries the standard of living of its employees is raised to a much higher level than the standard of living in any other country, and it is unfair to the seafaring profession to force them to a standard of living which would not be tolerated ashore.

Many critics of American shipping insist that Americans cannot operate ships. These gentlemen forget the records of the past, the most interesting of which is the era of the clipper ship, which commenced prior to the War of the Revolution and continued until just after the Civil War, when the era of steam vessels began. The years between 1843 to 1869 are to all Americans who love the sea the most interesting, as during this time American shipbuilders constructed the finest models of sailing ships ever launched. With these ships the American shipmaster proved himself superior to any shipmaster in the world, and it is a matter of record how American clippers were loading in China ports at higher freight rates while vessels of other nations could not get cargoes in the same port at lower freight rates, owing to the difference of speed, and here it may be well to quote from "The Clipper Ship Era," by Captain Arthur H. Clark, published in 1910.

"Of the men who commanded the American clipper ships, it may be said that they carried the ensign of the United States to every quarter of the globe, with honor to their country and themselves. Each had his strongly marked individual traits of character and his human weaknesses. Nothing could be more remote from the truth than to imagine these men as blustering bullies at sea or rollicking shellbacks on shore; neither were they Chesterfields or Carpet Knights, afloat or ashore, nor at all the type of skipper that one is apt to meet in works of fiction. Many of them might easily have been mistaken for prosperous merchants or professional men, until a more intimate acquaintance disclosed the aura of salted winds and surging seas, and a world-wide knowledge of men and cities. It may well be doubted whether braver, truer-hearted gentlemen or finer seamen than many of the American clipper ship captains of half a century ago have ever sailed the seas."

When these men won the supremacy of merchant shipping for American vessels it was said of them in 1860 by a critic of the merchant marine of another nation: "We have no masters who can match the masters of American vessels, and until we do, and allow them full control of our vessels, we cannot compete successfully."

Even in those early days it was thoroughly understood that the success or failure of the venture was solely in the hands of the master.

Succeeding the era of clipper ships came the era of steam, and as other nations built and operated steamships the American ensign gradually faded from the sea, and the year 1913 saw American shipping at its lowest mark.

OCEAN SHIPPING DURING AND AFTER THE WORLD WAR

The World War commenced in 1914 and naturally the demand for tonnage grew, and as the demand increased the rates soared. Since everything connected with the shipping interests follows closely the law of supply and demand, the operating cost during the war period attained such heights as to be unbelievable. During this period of inflated prices, as a defensive measure, America had constructed a large number of vessels, and when peace was declared America found herself in possession of one of the greatest merchant fleets the world had ever dreamed of. It then became a problem how to make the best use of this fleet.

It is useless to attempt to conceal the fact that at this time there existed many steamship companies, whose organizers and officials knew little about the shipping business and less

*Paper read before the Society of Naval Architects and Marine Engineers, New York, November 9, 1922.

†Commodore of the Black Diamond Steamship Corporation, New York.

about the traditions and established customs of the sea. Wages soared, conditions afloat and ashore became impossible, operating costs were excessive, claims for cargo damage and loss were unreasonably high, and with the perfection of systems of communication the status of the master and officers was reduced to practically that of a high priced office boy—obeying orders issued from ashore by those who were intoxicated by high freight rates and large profits, who thought more of the American dollar than they did of the safety of the vessel or its mark. However, as freight rates decreased, it was realized that steamship companies founded on inexperience could not endure, and it is to the credit of the profession to say that ability, experience, and efficiency are being recognized and will eventually regain control.

During the past two years, rates have fallen to the level of, and in some instances to a point lower than pre-war rates, and in the struggle of American vessels for existence in the shipping world against the bitter competition of foreign vessels which enjoy a lower operating cost, as well as a government subsidy, American shipping has reached that stage where the cost of efficient operation means success or failure to our merchant marine as a whole.

It is a fact that, among the various grades of ship officers, the American merchant marine can boast of having many who are efficient, but unfortunately many masters lack sufficient business training, due to the modern method in steamship offices where the master is not allowed to handle details with which he should be familiar, and naturally in this connection the shipowner is standing in his own light.

COMPARATIVE COSTS OF OPERATION IN THE TRANSATLANTIC TRADE

To establish a basis of comparison of the cost of operation for all classes of ships is an impossibility, and after considering the mass of data available it was decided that each vessel was an individual study.

Herewith are presented data of three vessels in transatlantic trade, reduced to an average of one voyage and all expenses are included; total cost represented as 100 percent:

	Example A Percent	Example B Percent	Example C Percent
Fuel	23.6	29.9	27.9
Stevedoring, tally, watching, clerks...	20.6	16.0	22.9
Wages on ship	11.2	14.4	13.0
Insurance	10.4	8.1	12.0
Wharfage	7.7	1.9	2.2
Agency and brokerage	4.9	3.4	2.7
Grain fittings	3.1	2.9	...
Food for crew	3.0	3.0	1.4
Stores deck department	2.0	2.9	2.9
Stores engine department	2.5	3.4	3.6
Stores steward department	0.2	0.3	0.25
Advertising	2.4	0.4	0.3
Towboats	1.8	1.5	1.4
Pilotage	1.3	1.3	1.4
Port charges	1.4	1.8	1.6
Repairs	1.6	5.1	3.6
Miscellaneous	2.1	3.5	2.6
Laundry	0.2	0.2	0.25
Total	100	100	100

From a study of the above data one readily sees that fuel, cost of handling cargo, wages and insurance are the most important items of expense.

FUEL EXPENSE

Fuel is the most important item of expense in operation and is a subject to which little intelligent study has been given, and while general results have been compared, very little satisfactory data are obtainable. The United States Shipping Board has just appointed a committee to study this

subject; this committee is afforded a great opportunity to render service to the profession.

The prevailing practice today is to buy fuel on a price basis, and no consideration is given to the heat units contained therein nor to the subsequent results obtained.

In vessels using oil fuel, where this fuel is carried in double bottoms, sufficient attention has not been given to the arrangements for heating the fuel in the tanks, with the result that in cold weather considerable loss occurs. However, many interested in efficiency feel that the Shipping Board Fuel Committee will submit data and promulgate a set of rules of procedure which, if followed, will greatly improve results.

CARGO HANDLING COSTS

Next in importance to fuel is the cost of handling cargo, which includes loading, checking, sorting, watching, and clerk hire on dock. Investigation revealed that the total actual cost per ton of general cargo handled in New York varied from \$1.15 a ton to \$1.65, and in the ports on the Atlantic coast the range in cost per ton was from \$0.92 to \$2.15. One interesting example is as follows:

Cargo handled 152.4 tons general.	
Stevedoring	\$137.00
Cooperage	75.00
Watching	70.00
Sorting and delivering	284.00
Total cost	\$566.00
Average cost, \$3.71 per ton.	

One only need check up on a ship during the loading and discharging to realize where the money goes. This item alone, on an average, is one-fifth to one-sixth of the total expense and is seldom checked as to delays, waiting, overtime, etc. With proper supervision, even with the high rates of pay, this excessive rate per ton could be greatly reduced.

WAGES

Third in importance in operating cost of a vessel are wages afloat. So very much unreliable data have been printed about this subject that great care was exercised to obtain only authentic data, and the rates of pay quoted on American vessels was taken from shipping articles which are on file in the commissioner's office. The rates of pay on foreign vessels were obtained from vessels in service and shipowners, and for the benefit of those who are interested the information is tabulated and herewith presented in the hope that it will speak for itself.

The standard of living in this country is so different from that in foreign countries that it is absolutely unfair to compare American wages with those of foreign vessels.

One of the most unfortunate lines of reasoning today is that by cutting wages one obtains efficiency. It matters not in what capacity a man is employed, if the wages for that rating are higher than the wages for the same ratings in other lines, then the most efficient man will be found for the place.

Perhaps the reader may find in the scale of wages herewith presented sufficient explanation as to why the native born American does not adopt the profession of the sea.

INSURANCE

Much could be written about the subject of insurance—all classes—but it would not influence the prevailing opinion of those who should know the subject fairly well. Any discussion on this subject can be summed up by saying that when loss and damage are high the rate is high and when loss and damage are low the rate is low. This cost could be reduced by bonus to ships' officers and self-insurance.

The remaining items which enter into the cost of operation are either unavoidable or under the supervision of the personnel afloat, and if care has been exercised to select only

WAGE SCALE EFFECTED ON JULY 1, 1922

	U.S.S.B. Scale	A.S.O.A. Scale	Private Owned American Actually Paid		British		German		Danish		Swedish	
					£	\$4.40	Marks 400 to \$1		Krone	1 Krone 21½c	Krona	1 Krona 25½c
Master	\$270.00	\$275.00	.....	.....	£45	\$198.00	6,000	\$15.00	...	.....	...	.....
1st mate	165.00	165.00	\$150.00	\$150.00	21-10	94.60	4,200	10.50	750	\$161.25	600	\$153.00
2nd mate	145.00	140.00	125.00	115.00	16	70.40	3,800	9.50	625	134.38	420	107.10
3rd mate	130.00	125.00	100.00	95.00	13	57.20	3,425	8.55	450	96.75	380	96.90
Wireless	90.00	90.00	90.00	80.00	13-10	59.40	.....	.....	.....	.....	.....	.....
Carpenter	70.00	70.00	45.00	40.00	12-10	55.00	2,750	6.90	345	74.18	300	76.50
Boatswain	65.00	.....	45.00	40.00	11-10	50.60	2,750	6.90	345	74.18	300	76.50
A. B. Seaman....	55.00	47.50	35.00	35.00	10	44.00	2,600	6.50	316	67.94	275	70.13
Ordinary seaman.	40.00	35.00	25.00	30.00	5-10	24.20	1,200	3.00	200	43.00	180	45.90
Chief engineer ..	240.00	250.00	240.00	225.00	24-10	107.80	5,500	13.75	1,100	236.50	430	109.65
1st asst. engineer.	165.00	165.00	150.00	150.00	20-10	90.20	4,200	10.50	850	182.75	400	102.00
2nd asst. engineer	145.00	140.00	125.00	115.00	16	70.40	3,800	9.50	650	139.75	350	89.25
3rd asst. engineer.	130.00	125.00	100.00	95.00	13	57.20	3,425	8.55	575	123.63	285	72.68
Deck engineer ..	70.00	70.00	45.00	.....	11-10	50.60	.....	.....	.....	.....	.....	.....
Oiler	65.00	55.00	40.00	42.50	11	48.40	2,750	6.90	450	96.75	290	73.95
Fireman (oil) ..	57.50	50.00	35.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fireman (coal) ..	.....	50.00	.....	40.00	10-10	46.20	2,650	6.62	322	69.23	275	70.13
Wiper	50.00	35.00	25.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coalpasser .....	.....	40.00	.....	35.00	10	44.00	2,400	6.00	215	46.23	...	.....
Steward	105.00	105.00	100.00	90.00	14-10	63.80	2,600	6.50	530	113.95	350	89.25
Cook	90.00	90.00	80.00	75.00	13-10	59.40	2,850	7.12	450	96.75	325	82.88
Baker	70.00	70.00	45.00	60.00	9-10	41.80	2,440	6.10	230	49.45	...	.....
Messman	35.00	35.00	35.00	40.00	8-10	37.40	2,440	6.10	90	19.35	80	20.40
Messboy	35.00	35.00	35.00	35.00	....	.....	1,525	3.81	...	.....	..	.....

efficient officers, it naturally follows that they will produce efficient results.

SUBSISTENCE

The question of subsistence, while not very large in total cost, is most important in having satisfied personnel afloat, and sufficient care should be exercised to see that food is properly prepared and made appetizing instead of the all too common practice of serving improperly prepared and unpalatable food.

The Shipping Board has recently placed a limit on the cost of feeding of 65 cents per man per day. My experience is that this is a generous allowance, provided that it is judiciously expended.

DECK AND ENGINE STORES

In the matter of deck and engine stores it would be well to work out an annual schedule of allowances and requirements. In discussing this subject with one of the profession, I found that he had worked up data for a company covering its fleet of quite a number of vessels, and on an average the figures of cost allowance check very close for requirements. For example, a vessel of the 7,500 to 9,000 deadweight ton class was allowed:

Deck department	\$17.30 per day
Engine department	19.15 per day
Steward sundries	5.25 per day

In comparing these figures with those of actual operation, they were found to be rather generous, and it only confirms the opinion that in these departments, with a fixed schedule, the former excessive cost can be reduced to a minimum.

Taken as a whole, one is impressed with the manner in which shipping is handled since the days of the World War, and while in many cases there is too much misdirected energy, the members of the profession realize that the time has arrived to establish the American merchant marine on a clean, efficient business basis, and to regulate the operating cost so that it will be on a par with international competition.

PERSONNEL

From a study of the data available, the writer is of the opinion that American ships can be made efficient, and excepting the excessive first cost, depreciation and overhead

expense, can hold their own against any competition. To accomplish this result there should be closer relations between the executives of companies and the masters of their vessels. Masters should be selected for their efficiency and given absolute authority over the operation of their vessels. Chief engineers should be selected likewise and given absolute authority over their own department. The master should be furnished with complete cost data so that he can remedy high cost over which he has control and show the owner the excessive cost over which he has no control, so that this handicap may be overcome.

EXPERIENCED MEN NEEDED

Managers and marine superintendents should be men who have served as master of a vessel. Superintending engineers should be men who have served as chief engineer of a vessel. Everything concerning the handling and stowage of cargo should be subject to the approval of the master of the vessel. If the master is to be held responsible, he should be given full authority regarding all details involved in the operation of his vessel.



Store Nordiske, New Oil-Fired Cable Ship

Built by Nakskov Shipyard, Limited, Nakskov, Denmark, for the Shanghai station of the Great Northern Telegraph Company. Principal dimensions of the vessel are as follows: Length, 238 feet 6 inches; beam, 35 feet; depth, 23 feet 6 inches.

Fuel Economy in Shipping Board Vessels*

Methods Prescribed for Purchasing Fuel—Instructions Given for Taking It on Board and Standards Set for Burning It

By Commander R. D. Gatewood†

AN analysis of the total operating expenses or outgo indicates that fuel alone amounts to from 22 to 25 percent of the total cost of running a ship. It is more than the wages of the men, the food they eat, the repairs to the vessel and the consumable stores all combined!

Realizing this, Mr. Joseph Sheedy, who is the first engineer to be made a vice-president of the Emergency Fleet Corporation, appointed a committee known as the Fuel Conservation Committee, whose chairman is Captain C. A. McAllister. A better selection it would be hard to find. An American engineer of high attainments, he was for many years engineering head of one of the most efficient departments of the Government, and one in which the appropriations have always been pared to the bone—namely, the United States Coast Guard. His experience in keeping within the extremely limited appropriations and his natural tendency toward thrift and economy, that comes to him from his Scotch ancestry, fit him eminently well for the position.

The committee conceives its problem to be to get the most out of the ships as they now are, without the expenditure of any very considerable sums to rebuild them. The Government is mandated by Congress to sell them, and except for certain major defects which must be corrected in a given ship here and there, the Government will not receive any more money for the ship after the expenditure involved in changing a lot of the machinery of the vessels; and the committee feels that the principal problem is to bring the present equipment up to its maximum performance.

To this end, the operating fleet of 400 vessels was analyzed with regard to the kind of fuel burned, and this analysis showed that 90 percent of the vessels burned oil and only 10 percent burned coal; whereupon it was immediately decided to concentrate the major effort of the committee on oil-burning vessels.

RESULTS OBTAINED ON THE S. S. AMERICA

In order to show, however, just what could be done with coal-burning vessels, the largest coal-burner in the fleet, except one,—namely, the *America*,—was chosen as the vessel to be given special attention and study. A careful analysis of her boiler and engine department was made, and it was at once apparent that certain changes were absolutely necessary in her boiler furnaces and fronts, some minor changes in valve settings and a number of other minor adjustments here and there throughout the engine department before the vessel would be ready to perform in accordance with the standard set for that type of machinery. All this work was done at a cost of not over \$7,000 or \$8,000, and then several special expert observers were sent on her to Europe and return, every possible care being taken to fire the boilers in the most economical way and operate the department in accordance with the best known engineering practice, considering the age of the vessel.

The results were truly surprising to the lay mind, but were no greater than the committee anticipated. Here was a vessel that had been sailing back and forth across the ocean for many months, making her schedule but with apparently relatively little regard for the fine points of fuel

consumption. On the very first trip the vessel saved 400 tons of coal on the round trip. She has just returned from a second trip and made a similar saving, maintaining on both trips equal or slightly better speed than for the past four or five round voyages. The total saving on the two trips more than outweighs the expenditure involved in correcting the defects that the committee found, and the vessel will continue to operate back and forth across the ocean, saving about 500 tons a trip over previous voyages. This will serve to give some indication of the practical nature of the work of the committee and the benefits to be derived therefrom.

PERFORMANCE STANDARDS TO BE SET

The committee has further subdivided its problem into one of sea consumption and port consumption; these two problems involve study along quite different lines. Some steamship lines operate well at sea and poorly in port; others operate economically in port but are very expensive at sea. The committee is now engaged in setting a set of standards for each and every type of vessel now operating, showing to the operators and the chief engineers exactly what their performance ought to be in the amount of coal burned per mile. Heretofore there has been absolutely nothing for the engineers to work toward as a standard. Already these standards have been developed for several types, and in practically every case the vessels are found to fall well below the reasonable standard set by the committee, and already there has been a marked improvement in these types to bring up the performance of the vessels and meet the standard or better it.

The port consumption problem will be attacked in the same way, but necessarily owing to the great number of vessels and the difference in their motive power, any such problem becomes a very large one and cannot be proceeded with too rapidly. The saving in fuel that may be possible is, however, a great incentive to the committee, for the reason that our fuel bill for last year was between \$35,000,000 and \$40,000,000, and if, as is confidently believed, we can save 10 percent of this amount, a truly creditable piece of work will have been accomplished.

EXPERT FUEL INSPECTORS APPOINTED

The committee began its work by an analysis of the specifications for the fuel and an examination into how it was purchased and inspected, and it was at once apparent that while the specifications were apparently adequate and sound and conformed to the specifications in the general business and governmental world, there was not an adequate staff to insure that the material actually purchased was in every case in accordance with the specifications. As a result of the work of the committee, expert fuel inspectors have been appointed at several of our principal ports to insure the best quality of fuel being obtained and placed on our vessels.

The next step of the committee was to standardize instructions for engineers for taking the fuel on board. Many lines had no specific instructions at all, and in no one place was the committee able to find a standard set of practical instructions covering the points to be observed by the personnel of the engineering staff of the vessel in taking on oil or coal. Standard instructions are being printed and will be furnished to every vessel in glass-covered bulletin

*Prepared for the Marine Exposition, New York, November 11, 1922.
†Director of the Department of Maintenance and Repair, United States Shipping Board Emergency Fleet Corporation.

boards installed on the bulkheads in the mess-room of the engineers, so that there can be no question in future as to what the personnel of the ship should do to insure the highest quality and full quantity of fuel.

FUEL OIL BURNING SCHOOL ESTABLISHED

From the very outset of the committee's investigation it was apparent that as, in most of the other troubles of the merchant marine, the personnel of the ship constitutes at least 25 percent of the trouble. The men simply do not know the essential principles of economical burning of fuel. They have been operating so long under rule of thumb methods that the practice on board ship in our merchant marine is deplorable as compared with modern high-class power station practice. It was soon apparent that we would have to provide expert instruction for the engineers who were to be in charge of burning fuel, and this could best be done at the Naval Experimental Fuel Oil Burning Plant at Philadelphia. Our Navy has taken the leading part in the burning of oil fuel, and it is recognized everywhere abroad as having the greatest experience and the largest amount of expert technical data in connection with this problem, of any Navy or, indeed, of any engineering body of men. Thanks to the hearty co-operation of the Secretary of the Navy and Admiral J. K. Robison, arrangements have been made with the Navy to turn over this splendid experimental plant as a school of instruction for engineers of the merchant marine, and two classes have already been graduated from the school.

A more enthusiastic lot of men it will be hard to imagine than these classes are, both before and after going to school, and already the cry has gone up to provide for an additional so-called post-graduate course for many of these men, who see the great possibilities of saving that are possible under the expert teaching at the school. The classes are limited to from twelve to eighteen men and the instruction requires five full days of eight hours each, in which are combined lectures and practical work with boilers, burners and various instruments for determining the efficiency of combustion.

The managing operators have given the most hearty co-operation to this school, and the number of applicants is already greatly in excess of the ability to provide for so many eager engineers. The graduates of the school are already beginning to spread something of the doctrine obtained there and the practical ideas so new and interesting to them, and it is not too much to say that within the next year our merchant marine should have the best qualified set of fuel burning engineers of any in the world.

PRINTED INSTRUCTIONS ON PRACTICAL POINTS OF OPERATION

The committee has arranged to provide all chiefs and first assistants on our vessels with a set of pamphlet instructions containing the practical points of operation of all the various machinery in the engine department, including pumps, dynamos, ice-machines, etc. These are to be taken from a set of standard instructions that have been used with the greatest success in the Navy, and even before these are ready for printing and distribution the demand for them is so great that instead of printing by the hundreds we will have to have them printed by the thousands.

Indeed, the whole subject of conservation of fuel, and the millions of dollars that can be saved by intelligently burning it, has taken on new life and is being talked of more in engineering circles aboard ship than almost any other single thing.

The final work of the committee, after having prescribed how the fuel should be bought, how taken on board, and the standard to be met in burning the fuel, will be to take each and every vessel that cannot maintain the standard

set and place an expert engineer on board for a cruise to analyze carefully every phase of the operating and engine department with a view of bringing the vessel up to the standard set for it, and there is no doubt in the minds of the committee that within the next year or so there will be practically no vessel operating for the Shipping Board that is not maintaining a standard of fuel consumption equal to or better than that obtained either by our operators or by the vessels of our own country in private operation in either domestic or foreign trade.

MARKED INCREASE IN EFFICIENCY

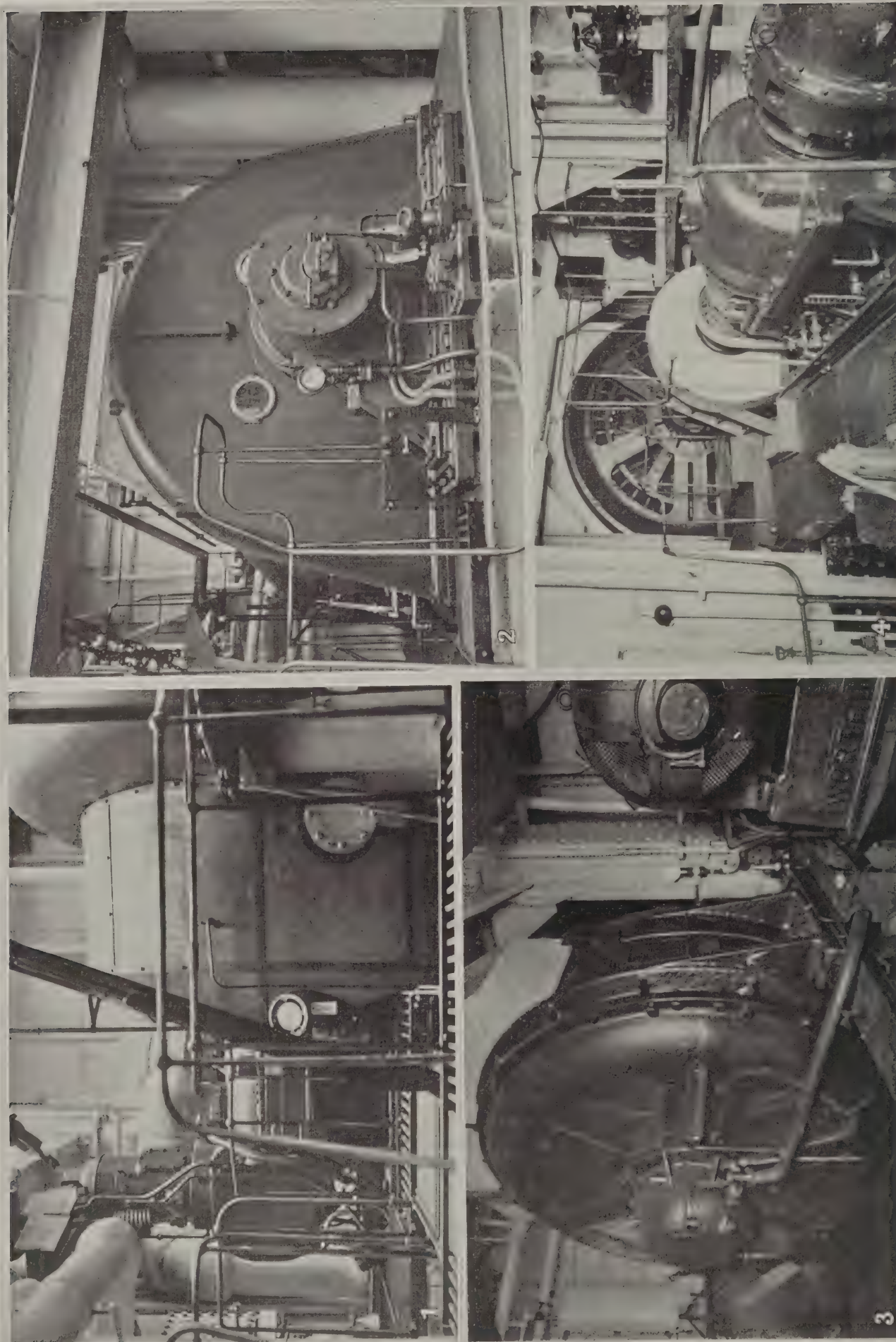
The mere fact that an experienced committee of engineers is going to go over the records of the performance of the vessel has already resulted in a marked increase in the efficiency of the performance of many vessels. The good men are anxious to make their performance so good that their present performance will be quite equal to any standard that might be required of them; the inefficient men are afraid of losing jobs unless they can show a performance that measures up well to the standard, and the psychological effect alone of such a committee has already been found to be of the greatest possible help in bringing up the efficiency of the engine department, even though the committee did nothing along the more practical lines outlined above.



(Photograph by Kadel & Herbert, N. Y.)

Largest Crane in the World at the Boston Army Base

The largest crane in the world, at the army base, South Boston, recently put in service, has a maximum capacity of 50 tons at radius of 90 feet. There are two auxiliary hoists with capacities of 15 and 5 tons at a radius of 130 and 133 feet, respectively. The crane without load weighs approximately 580 tons. This weight is distributed over 32 wheels, through a system of trucks which equalizes loads on the wheels. These wheels run on a 22-foot gage track. The trucks are so articulated that the crane will traverse the curve at the head of the dock, having a center line radius of 89 feet.



Figs. 1-4.—Propelling Machinery of H. I. M. S. Kamoi: (1) Steam End of Main Turbine Generator, Showing (at Left) Long Range Mechanical Governor; (2) Alternator End of Main Turbine Generator; (3) Starboard Propelling Motor, Looking Aft, at the Right Is the End of the Main Circulating Pump Motor; (4) Starboard Propelling Motor, Looking Forward, Showing Turning Gear and Thrust Bearing

Electric Propelling Machinery of H. I. J. M. S. Kamoi

Propulsion Is by Synchronous Motors—Three-Bearing Construction Reduces Length and Weight of Turbine Generator

By W. L. Wright*

THE success of electric drive for merchant ships has again made itself manifest in the performance of the H. I. J. M. S. *Kamoi*, which has recently departed from this country on its maiden and home voyage to Japan. The *Kamoi*, which was built by the New York Shipbuilding Corporation at Camden, N. J., for the Imperial Japanese Navy, was launched on June 8, 1922, the official acceptance trials completed September 5 and 6, and she departed for Japan with cargo on October 5. Although to be operated by the Japanese Navy, she was built in accordance with Lloyd's requirements and carries a merchant ship classification.

This vessel is primarily a fuel oil tanker, length 496 feet, beam 67 feet, mean draft, loaded, 28 feet 9 inches, has a capacity for approximately 10,000 tons of fuel oil, and, in addition, has a bunker capacity for approximately 4,000 tons of coal. She is twin screw and designed for 15 knots speed at 8,000 shaft horsepower.

MAIN PROPELLING MACHINERY

The main propelling machinery, which is of the turbine electric type, was built by the General Electric Company and consists of the following:

1—General Electric Curtis turbine, 10-stage, 8,000 horsepower, 2,400 revolutions per minute, designed for normal steam condition of 250 pounds gage, 150 degrees F. superheat, and 1.5 inches absolute back pressure.

1—Main alternating current generator direct connected to above turbine, and rated 2-pole, 6,250 kilowatts, 2,300 volts, 3-phase.

2—Main propelling motors of the synchronous type, arranged for induction starting, each rated 40-pole, 3,125 kilowatts, 4,000 horsepower, 120 revolutions per minute, 2,300 volts, 3-phase, each direct connected to a propeller shaft.

2—400 kilowatt direct current turbine geared generators, arranged for condensing operation, each 5,000/1,100 revolutions per minute, 400 kilowatts, 6-pole, 225/112.5 volt, 3-wire. For supplying ship's light and power and excitation for main generator and motors.

1—Auxiliary alternating current generator, rated 2-pole, 625 kilowatts, 1,100 revolutions per minute, for emergency propulsion, arranged to be connected through a flexible coupling to the ar-

mature shaft of one of the auxiliary generating sets, the turbine and gear of which have an overload capacity for delivering 625 kilowatts continuous at the alternating current generator terminals.

1—Main control panel with high and low voltage control group for controlling the main generator and motors.

1—Direct current switchboard for controlling the 400 kilowatt auxiliary generating sets.

ARRANGEMENT OF PROPELLING MACHINERY

The arrangement of the propelling machinery is shown in Figs. 7, 8 and 9. It will be noted that the main turbine generator is located on a 28-foot flat, together with the two auxiliary generators, direct current switchboard, and main control panel; while the main motors and engine room auxiliaries are located in the space below. The arrangement of machinery in this vessel demonstrates the flexibility with which the electric system of propulsion may be installed as compared with other types of drives in which the prime movers are mechanically connected to the propeller shafts. The main generator, as located, is near the neutral axis of the ship and is thereby least affected by the rolling of the vessel in heavy seas. The foundation for the main turbine generator also serves as a support for the main condenser, which is connected to the turbine exhaust flange by means of a diaphragm type expansion joint. Two motor-driven condensate pumps of 120,000 pounds per hour capacity are located on the engine room floor directly beneath the main condenser. The main circulating pump of 15,000 gallons per minute capacity, which is also motor-driven, is located immediately forward and below the main condenser. The main condenser is equipped with two Le Blanc air ejectors.

AUXILIARY GENERATING PLANT

The port side of the 28-foot flat is devoted to the auxiliary generating plant consisting of two 400 kilowatt direct current turbine geared generators and the direct current switchboard. The auxiliary turbines are arranged to exhaust normally into the main condenser. However, an auxiliary condenser is provided for port use. Provision is also made for operating these sets non-condensing by opening a valve

* Marine Engineering Department, General Electric Company, Schenectady, N. Y.

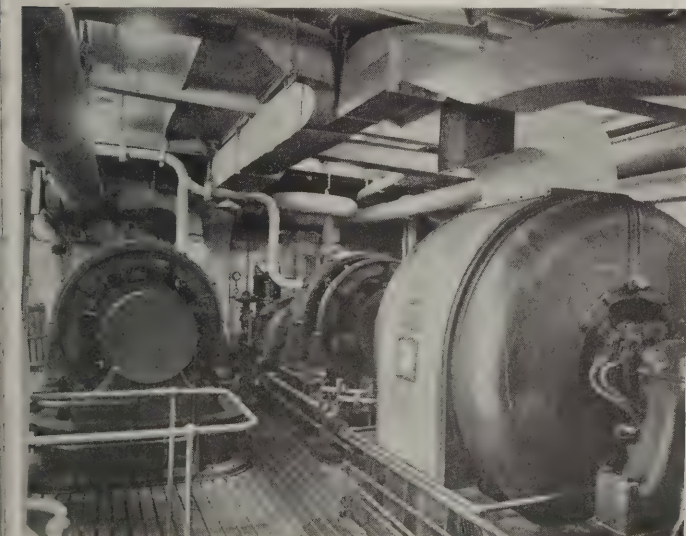


Fig. 5.—Auxiliary Turbine Generator Supplying Ship's Lighting and Auxiliary Power

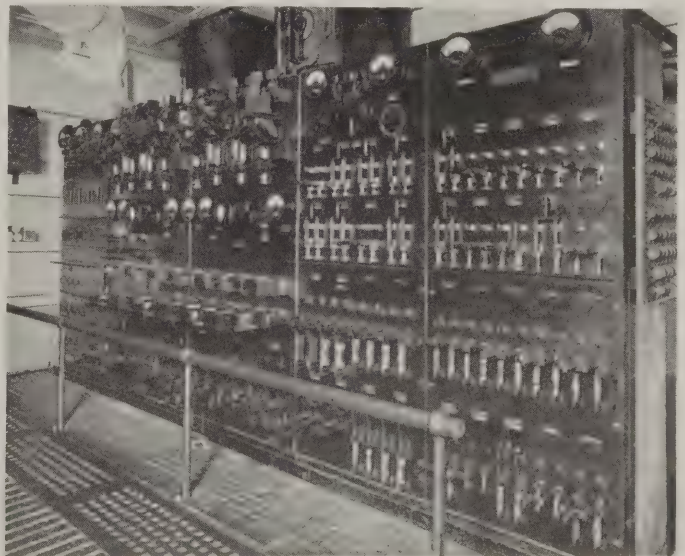
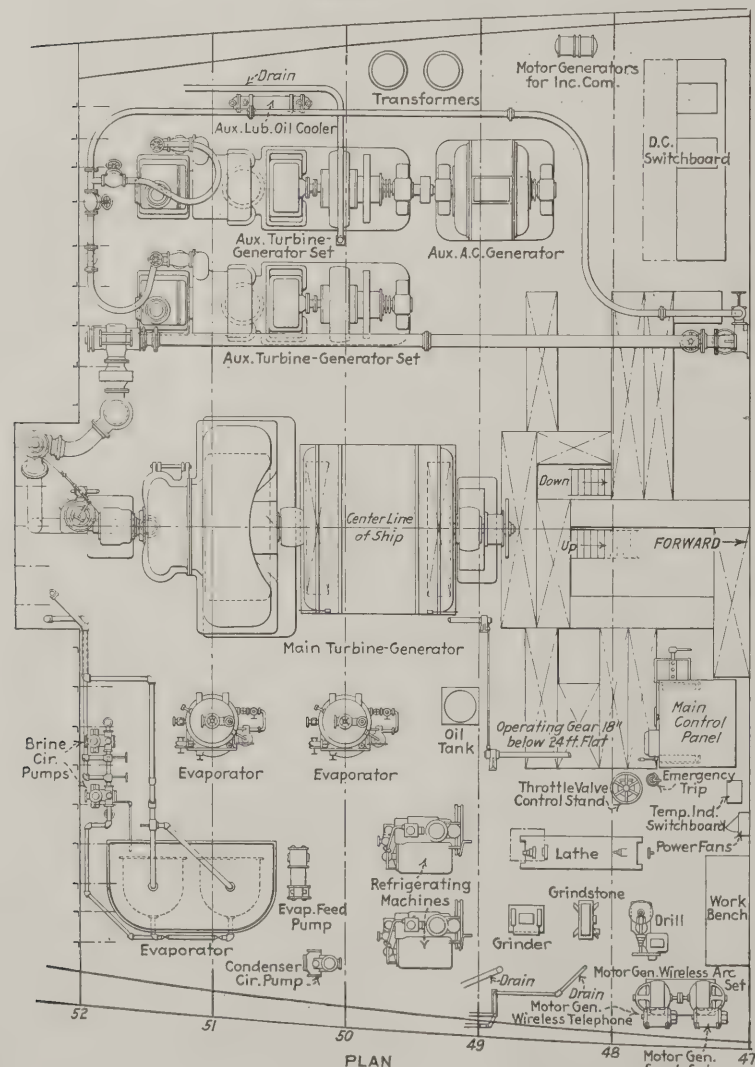
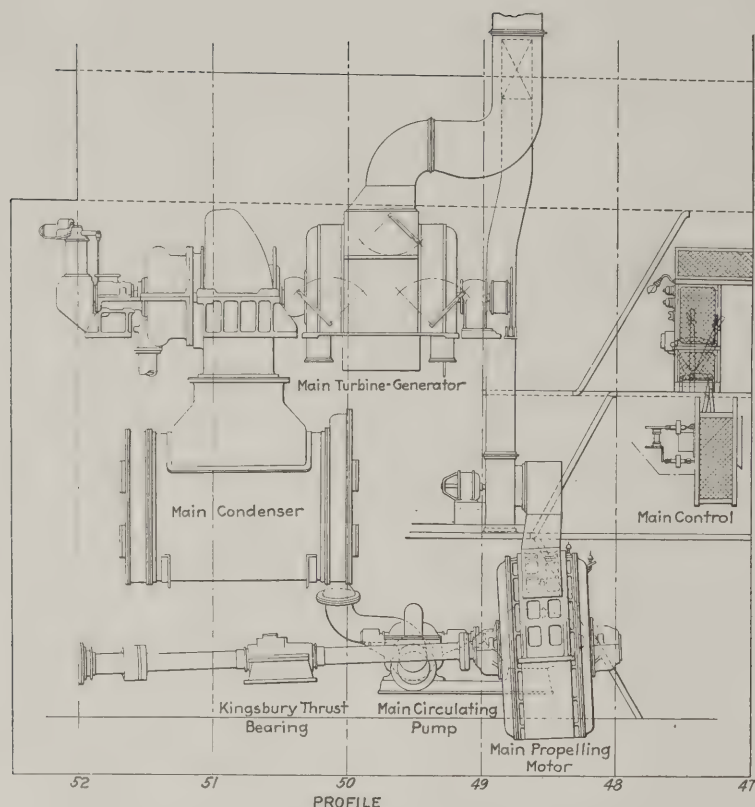


Fig. 6.—Direct Current Switchboard Controlling Ship's Light and Power Circuits



Figs. 7 and 8.—Elevation and Plan of Engine Room

to the auxiliary exhaust line. The excess steam above that required for feed heating and other purposes, when operating under this condition, is relieved to atmosphere through a spring loaded valve which automatically opens when the pressure in the auxiliary exhaust line rises above a predetermined value. The auxiliary condenser circulating and wet and dry air pumps are both steam driven.

The maximum lighting and power load of the vessel is such that only one set is required to operate at a time, thus always leaving one set in reserve. The alternating current auxiliary generator, which is used for propulsion in case the main turbine generator may become disabled, is arranged to be connected to the armature shaft of the outboard auxiliary generator. This is accomplished by means of a special flexible coupling which can be quickly engaged.

The direct current switchboard is located along the forward engine room bulkhead. This board consists of two generator panels and two lighting and power distribution panels. Provision is also made for supplying excitation for main generators and motors from this board.

On the starboard side of the 28-foot flat are located the ice machines, evaporators and machine shop.

MAIN CONTROL PANEL

The main control panel is located along the forward side of the engine room bulkhead, slightly to starboard on the same flat.

The contactor groups are suspended directly beneath the operating panel. The main cables connecting the main generators and propelling motors with the contactor groups are carried beneath the operating platform.

The main propelling motors are located in the engine room as far forward as possible in order to allow space for the turning gear, main thrust bearing and torsion meters and also to facilitate withdrawing the tail shaft without disturbing the main propelling motors.

VENTILATION OF GENERATOR AND MOTORS

Circulating air for dissipating the heat losses of the main generator and motors is taken from the engine room space. In case of the main generator the air is drawn through a suitable opening on the under side of the generator by means of fans built integral with the generator rotor. The air is forced through the air gap and passes out radially through suitable ducts built in the rotor punchings. The heated air is then forced through suitable ducts to the outside atmosphere.

In the case of the main propelling motors, the air from the engine room is drawn through screened openings in the end shields of the motor by means of a direct current motor-driven fan located just above and connected to the stator frame of the motor by suitable housing. The heated air is exhausted through a trunk which connects with the generator exhaust trunk and leads to the outside.

This arrangement of ventilation also aids greatly in ventilating the engine room by producing a constant change of air. Provision is also made for recirculating the heated air back into the engine room in case the temperature of incoming air is too low for the operating personnel.

The main propelling machinery as installed on this vessel, aside from the fact that special care has

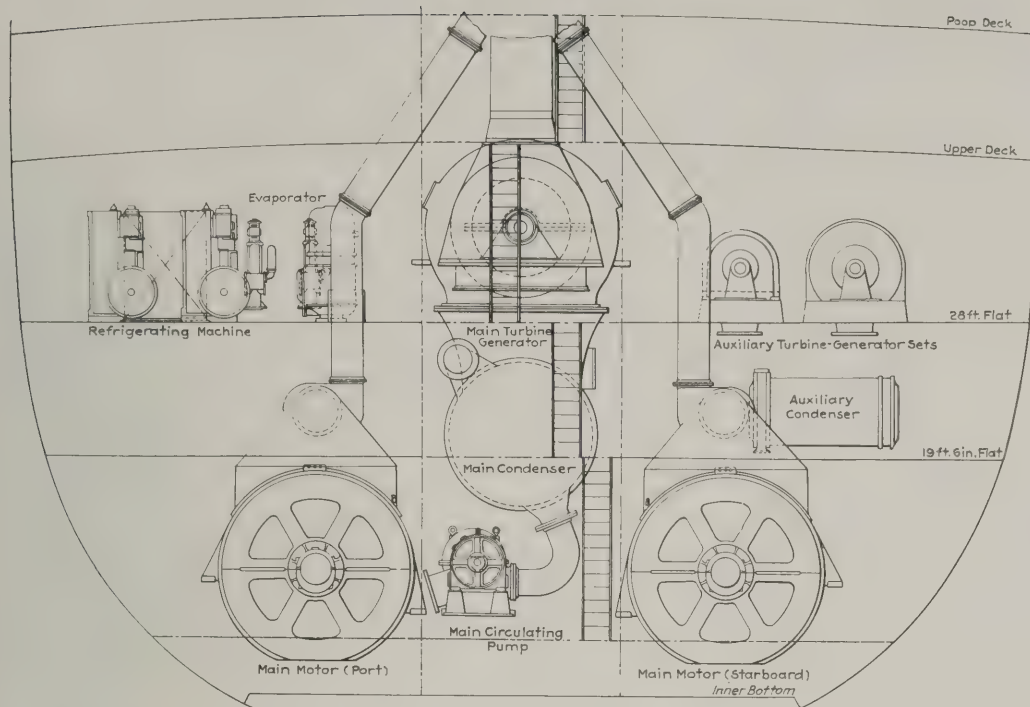


Fig. 9.—Transverse Section Through Machinery Space at Frame 48, Looking Aft

been taken in design in order to produce apparatus that is well adapted for marine service in regard to accessibility, rugged construction and the use of high class insulating material for electric circuits, has several outstanding features that point to the rapid progress that is being made in the adoption of electric machinery for propulsion of ships.

FIRST TWIN SCREW VESSEL TO USE SYNCHRONOUS MOTORS

The *Kamoi* represents the first twin screw vessel to employ the use of synchronous motors. The first application of the synchronous motor for ship propulsion was successfully demonstrated on the S. S. *Cuba* in 1920, a single screw, 3,000 shaft horsepower express passenger ship. This was followed in 1921 by four 2,600 shaft horsepower single screw Coast Guard cutters. The success of the synchronous motor for this type of drive was made possible only after the amortisseur winding had been properly developed and applied in order to get the necessary torque characteristics, peculiar to ship propulsion, for starting and reversing.

MAIN TURBINE GENERATOR OF THREE-BEARING TYPE

The main turbine generator is the first marine set of its capacity to employ the three-bearing type of construction in which the generators and turbine rotors are connected by a rigid coupling and supported by one middle and two end bearings. This feature shortens the length of the set, and, therefore, decreases the weight and space occupied under that required for a four-bearing set of equivalent capacity.

NEW LONG RANGE MECHANICAL GOVERNOR

The main turbine is also equipped with a new type, long range mechanical governor, capable of holding the speed from 25 percent to 107 percent normal. The turbine speed is controlled by means of a hydraulically operated controlling valve located in the main steam line, which is actuated by means of a relay type pilot valve connected with the long range governor. The control of this governor is connected electrically with the main control panel, thereby giving the operator absolute control of the turbine speed for maneuvering the vessel.

In this type of drive, it is found desirable to do maneuvering which involves starting, stopping and reversing of the

motors at approximately 25 percent speed of the main generator. A limit switch has therefore been provided in connection with the control of the variable speed governor to open the control circuit when the setting of the governor is such as to maintain 25 percent speed. A limit switch has also been provided on the upper extreme, so adjusted that the speed maintained by the operating governor cannot rise appreciably above normal. By actual test, it has been found that the speed adjustment of this governor can be regulated from the full speed setting to 25 percent speed setting in approximately 12 seconds.

Two hand valves for controlling groups of first stage nozzles have been provided on the main turbine. These nozzles are arranged in groups of eleven, always open, five under one hand valve and three under the other. For economic, continuous operation, different combinations of nozzles may be selected to give desired speeds, in which case, the variable speed governor may be adjusted a few percent above that speed. In this condition, the operating valve, which is controlled by the mechanical governor, is in the wide open position and all unnecessary throttling from the



Fig. 10.—Propulsion Control Panel

main steam line to the turbine bowl is eliminated and the first stage nozzles will therefore be operated most efficiently. In case of heavy seas which result in wide variation of load, the turbine can only rise in speed until the operating governor comes into play. This automatically prevents the turbine from overspeeding. When the load is increased, the operating valve again opens, but the maximum steam flow is determined by the given nozzle setting. This resolves itself therefore into a constant steam flow condition, where the variable speed governor becomes a speed limiting governor. In this connection, it is obvious that a vessel with this type of speed control is able to maintain a higher average speed in rough seas than a type of control depending upon manually operated gear.

EMERGENCY GOVERNOR FITTED

The turbine is also equipped with an emergency governor which is mechanically connected with the main throttle valve and set to trip at 120 percent normal speed. This governor also has the dual function of relieving the oil pressure on the hydraulically operated controlling valve, thereby affording double protection in case of emergency. The controlling valve is also arranged to close and shut down the turbine in case of failure of the oil supply.

Gravity tanks have been installed in connection with the lubricating system, arranged with suitable valves, so that in case of failure of the lubricating oil supply, the main turbine bearings are supplied from the gravity tanks for a sufficient length of time to bring the turbine to rest.

CABLES

The terminals of the main generator are connected to the high voltage control group by two 1,250,000 circular mil cables per phase. The motors are connected with the high voltage control group by one 1,250,000 circular mil cables per phase. These cables are especially constructed for marine service, insulated with varnished cambric, reinforced rubber jacket and armored with phosphor bronze tape.

The high voltage control group consists of ten air brake contactors, so arranged that the motors may be cut in, out or reversed, at the will of the operator. The low voltage control group consists of eight air brake contactors arranged for controlling the excitation for the main generator and motors. Contactors of both groups are normally operated electrically by means of a controller located on the front of the operating panel. Manual levers, located adjacent to the operating panel, are provided for actuating the contactors in case of emergency. Mechanical interlocks are provided to prevent using both systems of control at the same time.

HOW THE SHIP IS OPERATED

The controller which is normally used for operating the ship consists of a selector handle for each motor, these handles each having three positions, "Off," "Ahead" and "Astern." There is also provided a field lever with four positions, "Off," "1," "2" and "Run." The motor selector handles are so interlocked with the field lever that they cannot be moved except when the field lever is in the "Off" position, which provides that no high voltage circuits can be interrupted under voltage. By means of the motor selector handle, the operator selects the condition of operation of the motors, "Ahead," "Stop" or "Astern." The operation actuates by means of solenoids, the contactors of the high voltage group and closes the proper circuits between the generator and motors.

The first position of the field lever actuates the main generator field contactors which closes the circuit of the 225 volt bus. This places double excitation on the main generator for starting, the motor field being open, the motors start as induction motors on the special squirrel cage winding. After the motors have reached a constant speed, the field

handle is moved to position No. 2. In this position, the contactors in the motor field circuit are connected to the 112 volt bus, giving normal excitation on the motors and double excitation on the generator. With this position, the motors pull into step instantly and the field handle is moved to the "Run" position. This places normal excitation on the main generator supplied from the 125 volt bus.

The field current of the main generator and motors may be adjusted independently or simultaneously by means of a hand wheel on the front of the operating panel, a clutch and gear mechanism being provided to connect the respective rheostat arms with the hand wheel.

INSTRUMENTS ON OPERATING PANEL

There are provided on the front of the operating panel, Fig. 10, the following instruments and meters by which the operator may observe at all times the exact status of operation:

- 1—Polyphase indicating wattmeter for determining output of main generator.
- 2—Direct current ammeters, one for each main propelling motor, arranged with selector switch to read current in all phases.
- 1—Alternating current voltmeter for main generator.
- 3—Direct current ammeters, one for each main generator and motor field.
- 1—Temperature indicator for main generator field.
- 1—Excitation indicator for determining the degree of excitation required for holding the motor in step.
- 1—Alternating current ammeter to determine flow of current to ground through generator neutral.
- 3—Speed indicators of the magneto type, one for each main generator and motor.

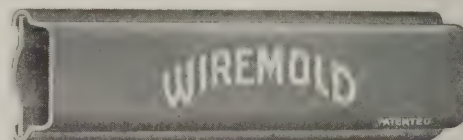
There are also provided two relays which are used in connection with the protective system which automatically opens the generator field contactors in case of abnormal unbalance of phases, or a ground on any part of the high voltage circuits including generator and motor windings.

TEMPERATURE DETECTORS

Temperature detectors are located in the armature windings of both main and auxiliary generators as well as the motors. The detectors are suitably imbedded in the slots adjacent to the coil by which the actual temperature of the coils may be determined. There are provided six detectors for each unit, same being connected to a suitable temperature detector panel, located near the control station. The temperature coils are so arranged that they may be connected separately to an instrument which indicates the temperature in degrees Centigrade.

New Conduit for Electric Wiring

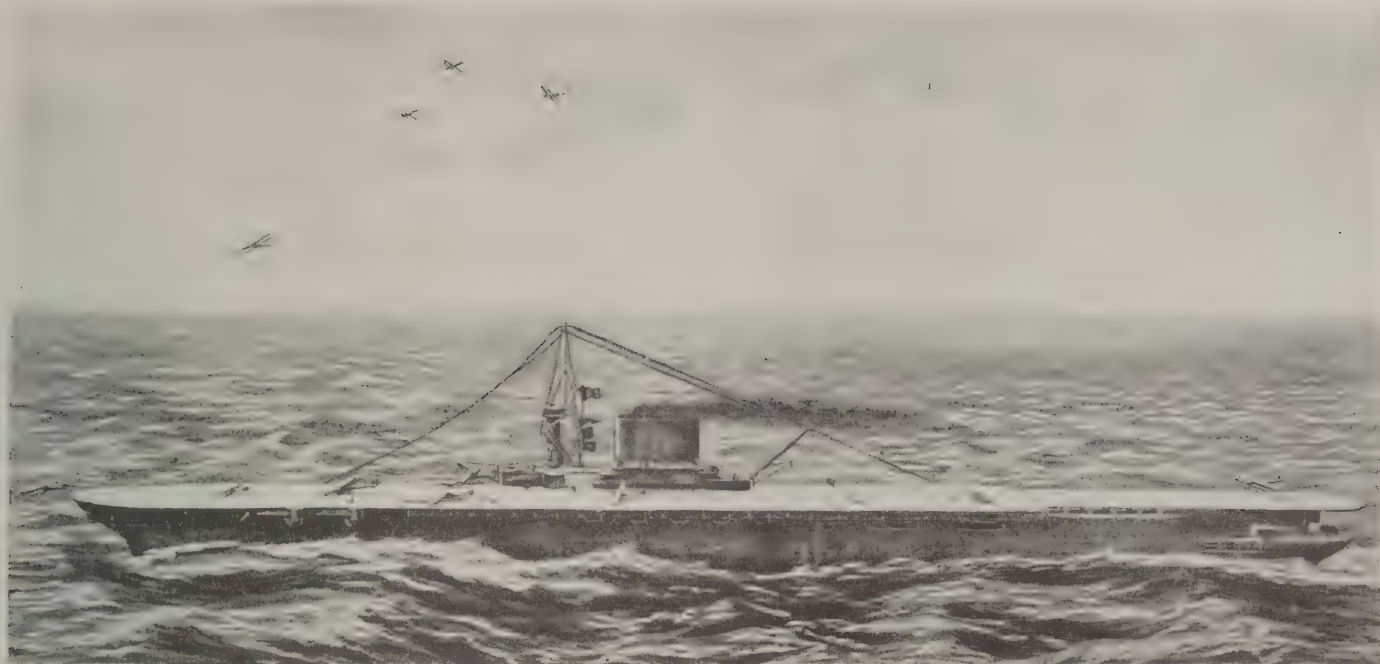
THE American Wiremold Company, Hartford, Conn., has recently been introducing a new product, "Wiremold conduit," to naval architects and shipbuilders for concealing electric wires on the surface in cabins and staterooms. It is a rigid, thin wall tube made in three and four wire



Section of Wiremold Conduit

sizes and furnished in ten-foot lengths with couplings. The wires are fished in after the conduit and base plates of fittings have been secured in position.

This system is expressly designed to harmonize with joiner work, is finished in an attractive neutral tint and can be readily retinted to match other colors, thus avoiding conspicuousness. It is inexpensive, easily installed and has already been used on numerous small craft.



Sketch of 33-Knot Airplane Carrier Now Under Construction for the United States Navy

Powerful Airplane Carriers Building for U. S. Navy

Electrically-Driven Battle Cruisers *Saratoga* and *Lexington* Being Converted Into Floating Airplane Fields—Will Have Speed of 33 Knots

EVEN the group of electrically driven fighting vessels that includes the U. S. S. *Maryland*, the most powerful battleship in the world, will be excelled in propelling power, speed and length by the two airplane carriers which are now building for the United States Navy and which will be launched in about a year and a half. Originally, these two vessels were to have been the battle cruisers *Saratoga* and *Lexington*. The modification of America's naval program, due to the decisions reached at the Conference on the Limitation of Armament, led to the conversion of these battle cruisers into airplane carriers.

The Navy at present has but one airplane carrier, the U. S. S. *Langley*, which has just been commissioned and given its sea trials in Chesapeake Bay. The *Langley*, which is named after the scientist who made the first practical investigation of aeronautics, was rebuilt from the old collier *Jupiter*, the first vessel of the Navy to be equipped with the electric drive.

The two aircraft carriers being built from the battle cruisers will be literally floating airplane fields. They will also be floating electric generating plants. As naval vessels they will be the longest in the world.

MAIN PARTICULARS OF THE VESSELS

They will be capable of developing 180,000 horsepower, through four electrically driven shafts. This is almost six and a half times greater than the propelling power of the *Maryland*, representative of the Navy's present speediest class of capital ships, which is rated at 28,000 shaft horsepower.

The speed of the airplane carriers will be over 33 knots, or 12.6 knots more than the speed of the *Maryland*. Their length at the waterline will be 850 feet and they will have a beam of 105 feet. The *Maryland* is 600 feet long at the

waterline, with a beam of 97½ feet. The length of the *Langley* is 520 feet, and her beam is 65 feet.

The vessel which was to have been the battle cruiser *Saratoga* is building at the Camden, N. J., shipyard of the New York Shipbuilding Corporation, while the vessel originally designed as the *Lexington* is being constructed at the Fore River shipyard of the Bethlehem Shipbuilding Corporation at Quincy, Mass. The launchings of these ships, as airplane carriers, are expected in the summer of 1924.

PROPELLING MACHINERY

Continuing the policy first adopted in the case of the *New Mexico*, these vessels will both be electrically equipped throughout by the General Electric Company. The propelling machinery, designed with the utmost care by the engineers of the General Electric Company, and the same, barring minor alterations, as was planned for the original battle cruisers, will consist of four turbine generator sets, supplying current to eight electric motors in each vessel. The turbine generators will be operated by steam from sixteen oil-fired boilers and each will have a rating of 40,000 kv-a., 5,000 volts three-phase, 1,770 revolutions per minute.

The motors will be connected in pairs to each of the four propeller shafts. Each pair of motors will have an aggregate weight of 440,000 pounds. Each motor will have a capacity of 22,500 horsepower and will measure fifteen feet in diameter.

The total weight of the propulsion apparatus will be 2,100 tons. Each generator set will be about 40 feet in length and each pair of motors about 34 feet.

The work that is being done on the propulsion machinery for these two airplane carriers is being carried on under the direction of Admiral J. K. Robison, Chief of the Bureau of Engineering, U. S. N.

In addition to the propulsion machinery, each ship will be provided with six 750 kilowatt, direct current turbine generator sets, which will furnish direct current for all electrical purposes except main propulsion. Among other purposes to be served by this auxiliary generating equipment will be the operation of steering gear, anchor windlass, ventilation fans and lighting systems.

The airplane carriers will be among the first vessels of the Navy to embody the unique surface cooler system of ventilating their electrical machinery. This is a new application, developed by engineers of the General Electric Company originally for war ships, and now modified for use likewise in generating stations on land.

MACHINERY VENTILATING SYSTEM

On the aircraft carriers each of the four generators will have sixteen cooler sections and each of the eight motors will be provided with twelve, making a total of 160 cooler sections for the entire vessel. The coolers will make the electrical units entirely self-contained.

Formerly, a system of air ducts passed from the electrical machinery up through the hull of the vessel to the deck. Cooling air was drawn in through one set of ducts, and after passing over the electrical units and absorbing the heat, was sent out through another set. For vessels of 180,000 horsepower capacity, the duct openings would necessarily be numerous.

But the ducts are entirely eliminated by equipping each generator and motor with the radiators or coolers. These consist of a series of tubes through which water, pumped in from the sea, is circulated. The air that comes from the electrical machine is cooled by passing over the tubes, and the same air is then returned to the electrical apparatus, where it is again heated and again passed over the cooler, completing a cycle that is in continuous operation. The water in the cooler tubes, upon absorbing the heat from the air, is pumped out again into the sea. The elimination of the duct openings will result in vessels that are better protected from attack and are more seaworthy in storms.

RADIO EQUIPMENT

Like the *Langley*, these vessels will give particular attention to radio operations. Although to all appearance they will have decks that are almost unobstructed by masts and aerials, nevertheless, they will be completely fitted out for sending and receiving radio messages. Their aerials will be run to the deck from a single topmast, which can be lowered when necessary.

Below decks provision will be made for storing and maintaining a considerable number of airplanes and elevators and cranes will be installed with which to hoist them up from below, preparatory to hopping off from the flying deck. The flying decks will be unbroken except for a combination funnel enclosure, set off at one side of the hull.

Diesel Engined Tug Displaces Steam Craft

THE Abitibi Power and Paper Company, Ltd., Montreal, Canada, which operates a large paper mill at Iroquois Falls, Ontario, recently commissioned Ralph E. Winslow, naval architect, Atlantic, Mass., to design a new motor towboat to replace three steam towboats which the company formerly operated. The new tug, the *F. H. Anson*, is designed to tow booms of logs containing about 3,500 cords of wood for pulp wood from Couchiching Falls to Twin Falls, a distance of about twenty-two miles on the Abitibi river, Canada.

As it was expected that the tug would have to make a round trip each 24 hours, accommodations were provided for two crews as well as for extra raft men and company officials, although the tug itself could be operated by a crew of four men. As on this run the draft is unrestricted, the vessel was made deep enough to immerse a four-blade Columbian bronze propeller 6 feet 6 inches diameter by 4 feet 6 inches pitch. The principal dimensions of the tug are:

Length overall	83 feet
Length on waterline	77 feet 4 inches
Beam	20 feet
Draft	9 feet 6 inches
Shaft horsepower	300

The machinery equipment consists of a direct reversible 6-cylinder 12 15/16-inch by 18-inch Winton Diesel engine developing 300 brake horsepower at 210 revolutions per minute, a Winton auxiliary air compressor driven by a 12-horsepower motor, an Exeter bronze fuel oil transfer and service pump driven by a one horsepower motor, an Exeter fire, bilge and general service pump driven by a 5 horsepower motor and a 10-kilowatt Crocker-Wheeler electric generator driven by a 15 horsepower Frisbie engine. There is also a 25-cell 32-volt Edison storage battery and a 14-inch low-volted searchlight.

The hull was constructed in Northern Ontario under the supervision of the designer. The scantlings are in excess of Lloyd's requirements. The keel, frames, stem, stern frame,

etc., are of yellow pine and the ceiling and decks of Oregon pine. Three watertight bulkheads divide the hull into four watertight compartments. The fuel tanks hold 4,200 gallons.

Accommodations are provided for 12 men, six in the fore-castle, two in the engineer's stateroom, two in the captain's room and two in the company officials' room. In addition, there are the usual mess room, galley, storerooms, etc.

PERFORMANCE OF THE TUG

When running light the tug has a speed of 13 miles per hour. While towing rafts of logs about one-half mile long and about 800 feet wide the speed is 1 1/4 miles per hour.



Diesel Engined Tug F. H. Anson

The fuel consumption at 260 revolutions per minute, corresponding to 375 brake horsepower, is 24 gallons per hour; at 196 revolutions per minute, corresponding to 300 brake horsepower, 22 gallons per hour; and when towing at 176 revolutions per minute, corresponding to 287 brake horsepower, 18.5 gallons per hour. During the first six days of operation the tug delivered to the mill 14,500 cords of pulp wood, which the owners state is more than the three steam tugs, which the Diesel engined tug has replaced, could deliver in ten days' time.



Twin Screw Motor Passenger Liner Adda

Recent Motorship Building in Europe

New Motor Passenger Liner Adda Has Many Interesting Features—Danish Motorship Arizona Completes Her Trials

By Our Special London Correspondent

IN view of the fact that only a short time ago, an order was placed by the Union Steamship Company, of New Zealand, with the Fairfield Shipbuilding Company on the Clyde for the construction of a 20,000 ton motor passenger liner, the completion of the trials of the motorship *Adda* towards the end of November aroused a great deal of interest in shipping circles. The *Adda* is the finest and largest motor passenger liner that has yet been built, although she is not very different from the *Aba* (described in the January, 1922, issue of *MARINE ENGINEERING AND SHIPPING AGE*), which was placed in service a year ago.

The *Aba*, however, although holding the honor of being the first motor passenger liner in the world, was a converted cargo ship and is therefore perhaps not quite so fine an example of the shipbuilders' art as the *Adda*.

This vessel is to engage upon the regular mail and passenger service of the Elder Dempster Line between Liverpool and the West Coast of Africa, and is the finest ship now operating in that trade. She has a displacement 12,800 tons on a length of 450 feet. Her beam is 57 feet and her molded depth to the awning deck is 34 feet 6 inches. She is designed to maintain a speed of from 13 to 14 knots and has accommodations for 225 first, 74 second and 32 third class passengers.

From an engineering point of view, she is remarkable in many respects, quite apart from the adoption of internal combustion engines for propulsion. Coal has been entirely

eliminated, and electricity is used throughout for all auxiliary purposes, except for the main cooking range in the galley, and in this, oil fuel is utilized.

MAIN PROPELLING MACHINERY

The main engines consist of two of the standard Harland and Wolff sets, as built under license from Burmeister and Wain. They are eight-cylinder machines of normal type, developing 6,000 indicated horsepower at from 110 to 115 revolutions per minute, and they are similar in practically every particular to the motors which were built in the United States by the Wm. Cramp and Sons Ship and Engine Building Company and installed in the *Californian* and *Missourian*. In these large engines, however, it is found desirable to have two separate injection air compressors driven off the end of the crankshaft and arranged in tandem. This is a tacit recognition of the fact that the air compressor is now perhaps the most vulnerable part of a Diesel engine's equipment, and in the case of the engines of the *Adda* one of the compressors is sufficient to supply all the injection air necessary, so that, if there is a breakdown of an air compressor, the engine need not be stopped or even slowed down to any extent.

On trials these motors are found to have a fuel consumption of about 0.3 pound per indicated horsepower hour and the total amount of fuel required daily for the operation of the vessel, including that used for all auxiliary purposes, does not amount to more than 20 to 22 tons for a speed of



First Class Dining Saloon of Motorship Adda

about $13\frac{1}{2}$ knots. The diameter of the cylinders is 29.13 inches and the stroke is 45.28 inches.

STANDARDIZED AUXILIARY SYSTEM

Harland and Wolff, in the larger motorships which they have built for many British shipowning concerns, have standardized an auxiliary system, which, although apparently expensive, is almost ideal for the purpose. This arrangement is adopted in the *Adda* where there are four separate electric generating sets, arranged on the port side of the engine room in line. Each of these plants is driven by a three-cylinder four-cycle Diesel engine of 150 brake horsepower running at 300 revolutions per minute, the dynamo having an output of 100 kilowatts at 220 volts. The power is taken to a large switchboard mounted on a platform at the after end of the engine room and an interesting feature is the fact that the emergency lighting set which is installed in the steering gear house can be connected on to the main switchboard in the engine room to supply additional power if required.

The unusual plan has been adopted of having the emergency set an exact duplicate of the generating plants in the engine room, so that there are altogether five 100-kilowatt dynamos in the ship. This large plant is quite necessary, as may be imagined when it is stated that the motors are coupled up to the electric circuit and would, if all were operating at the same time, require between 800 and 900 kilowatts.

As is usual in Burmeister and Wain type equipment, all the auxiliaries required for the operation of the main engines are separately driven by electric motors. Unlike the American system, the cylinder jackets are cooled with salt water and the pistons with fresh water, separate electrically driven pumps in duplicate being provided for the circulation of the water.

The fresh water is passed through a cooler around which the sea water circulates before it enters the pistons. Lubricating oil is supplied from three small rotary pumps coupled to high speed electric motors and the bilge and general service pumps which are of the plunger type are also electrically driven.

AMPLE MANEUVERING POWER

British shipowners are very conservative in their ideas of the requirements of starting air for maneuvering purposes. As a result of this, as on many other British ships, a couple of large auxiliary maneuvering air compressors are installed, whereas in corresponding Scandinavian and American ships one is deemed sufficient. Each of these compressors, which is of the two-stage type delivering air at about 350 pounds per square inch, is driven by a motor of 180 horsepower and runs at 250 revolutions per minute.

The *Adda* carries 5,000 tons of cargo in addition to her passengers, and the cargo handling equipment comprises 12 electrically driven winches of the four-ton type. The controller for each individual winch is mounted on the top of the casting, but all the contactors and resistances are located in one large contactor house on deck. This is a usual system and although it occupies a good deal of space on account of the necessity of providing a large housing, it is found more satisfactory than the provision of a rheostat on each of the winches.

ACCOMMODATIONS

A feature of the accommodation is the number of single berth staterooms which are located on the bridge deck. These rooms are paneled in white and are furnished with a single bed of the cot type, a wardrobe and easy chair. On the awning deck there are two sets of suites each accommodating two passengers. Pullman berths are fitted in the suites and each has its private bath.

The double berth cabins are arranged on the tandem principle giving every room access to the ship's side. Each first class stateroom has a fresh water supply and basin with a special discharge which eliminates the necessity for a slop tank.

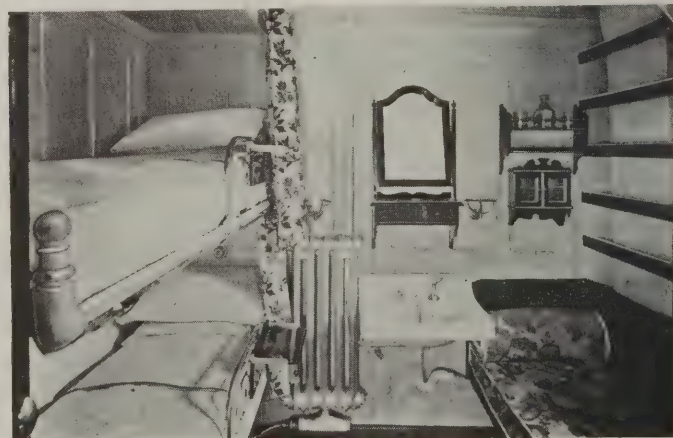
The second class cabins are unusually attractive to this class of travelers and are arranged in two- and four-berth rooms located on the main deck aft of the second class dining saloon. They are fitted with folding lavatories, wardrobes and the floors are covered with linoleum, with carpet and carpet runners.

VENTILATION

One of the most complete systems of forced ventilation has been installed so that the passenger in the privacy of his cabin may enjoy, with the aid of forced draft and fans, any



Second Class Smoking Room of Motorship Adda



First Class Cabin on Motorship Adda



Danish Motor Cargo Ship Arizona

particular degree of fresh breezes that he desires. There are 19 electrically driven Sirocco fans which are located on deck employed in the ventilation system and each cabin is supplied with individual fans under the control of the passengers.

SAFETY FEATURES

Twelve fully equipped lifeboats and a motor launch are installed which will take care of all on board in a case of emergency. These boats are handled by the Welin semi-rotary type of davit. Watertight doors below the main deck are electrically controlled from the bridge. Eight watertight bulkheads are fitted below the awning deck dividing the hold into seven spaces and above this deck steel bulkheads with fireproof doors divide the passenger accommodations into fireproof compartments. Chemical fire extinguishers are distributed throughout the passenger accommodations and a fire alarm system is installed that will immediately apprise the officer on watch of the location of any incipient blaze. Emergency power and light are secured by a 100-kilowatt dynamo installed on the awning deck which is capable of supplying all the essential services in cases of an emergency.

AN ELECTRICAL SHIP

Windlasses, cargo winches, steering gear, all engine room auxiliaries, fans, galley appliances and laundry appurtenances are driven by electric motors. Electric vapor radiators are installed in both passenger and crew space. These radiators are similar to the ordinary hot water or steam type except that the hot water is heated by an electric coil beneath each radiator. It is claimed that the loss of water is extremely small and that they are more economical than the central heating system, the average power required being about 1,000 watts.

REFRIGERATION

Insulated cargo and store spaces are fitted in No. 3 hold. Separate chambers are provided for poultry, meat, fish and fruit. The refrigerating machine was made by J. & E. Hall, Limited.

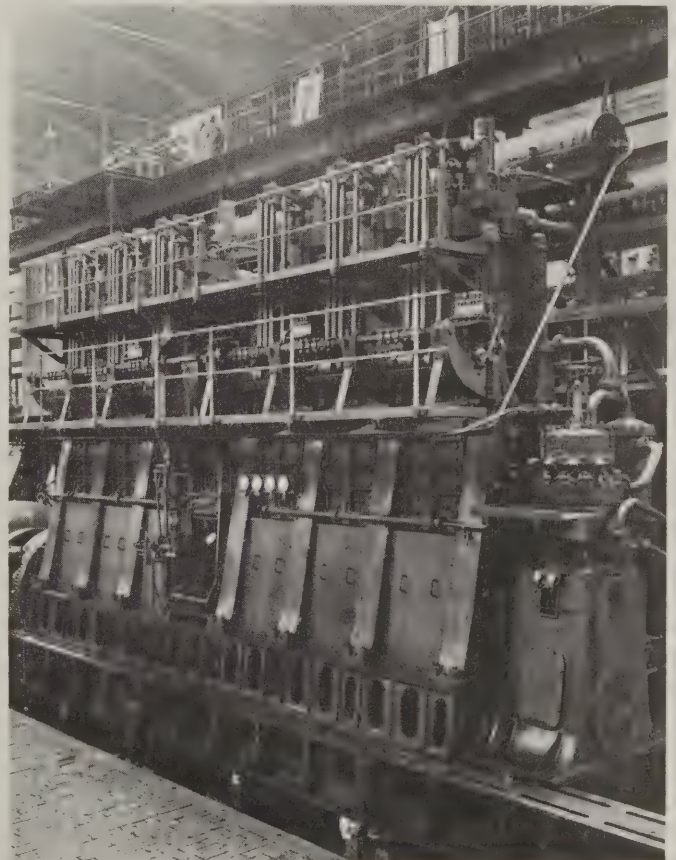
INTERESTING FEATURES

The hospital, which is located on the docking bridge, is

fitted with swing beds which counteract the rolling of the ship.

The laundry has been designed to take care of the passenger washing, a feature that will be appreciated by travelers.

In addition to the 12 electrically-driven cargo winches, a powerful warping winch with large drum ends has been



Assembly View of Engine of Motorship Arizona

installed which can be used as an emergency steering gear.

The scientific instruments used in navigating include a Clay automatic steering control which prevents errors in the execution of helm orders, pneumaticators for taking exact draft, tank gages in engine room to give direct readings of the fuel in the double bottoms, and long distance thermometers to give the temperature in the cold storage rooms.

Fuel oil is carried in the double bottom and in deep tanks aft of the motor rooms. She carries about 820 tons of oil which can be pumped aboard in about 5 hours and which is sufficient to enable her to make a round trip to West Africa and back without refilling.

MOTORSHIP ARIZONA GIVEN TRIAL

The motorship *Arizona*, which has recently completed a trial trip, was built by the Naskov Shipyard, Naskov, Denmark, for the United Shipping Company of Copenhagen. The principal dimensions and other particulars of the vessel are:

Type of ship	Cargo
Length between perpendiculars	405 feet 0 inches
Breadth, molded	54 feet 0 inches
Depth	36 feet 6 inches
Draft loaded	26 feet 0 inches
Deadweight capacity	9,100 tons
Stipulated normal average speed at sea	about 11 knots
Stipulated normal consumption of fuel oil per day	9 tons

MACHINERY

Type of machinery	Burmeister and Wain's 6 cylinder, 4 cycle Diesel engines
Number of main engines	2
Cylinder diameter	23.23 inches
Stroke	35.43 inches
Revolutions per minute	140
Indicated horsepower	2,800
Brake horsepower	2,200

The trial results over the measured mile in the Sound, on November 17, were:

Indicated horsepower, average.....	3,132
Revolutions per minute, average.....	144.5
Speed, average, knots	11.215

During the consumption test, the main engines developed 2873.6 indicated horsepower at 141.4 revolutions per minute, at a fuel oil consumption of 0.311 pound per indicated horsepower hour, net calorific value being 18,000 British thermal units, including the consumption of auxiliary engines producing the necessary current for the auxiliary machinery, steering engine and electric light.

The machinery is placed amidships and is of Burmeister and Wain's standard type for twin screw ships. The main engines are short stroke, forced lubricated crosshead engines, fitted on the front end with three-stage air compressors supplying the necessary injection air for atomizing the fuel oil.

All auxiliary machinery in the engine room as well as the deck machinery is electrically driven, the necessary current being supplied by three 50-kilowatt Diesel dynamos. The voltage of the current is 220 volts and for the lighting purpose it is transformed down to 110 volts by means of a motor generator.

Each of the generators is sufficient for supplying the necessary current under normal working conditions at sea, whereas two or all three generators have to be started, when the consumption of current is large, i. e., when maneuvering with the maneuvering compressor running or when loading or unloading the winches using much current.

The heating is effected by means of steam produced in a small cross tube boiler, this boiler also being able to deliver steam for fire extinguishing in holds.

The *Arizona* is the fourth motorship in the fleet of the United Shipping Company, Copenhagen, the other three motorships also being furnished with Diesel engines from Burmeister and Wain.

A Nesting Lifeboat With New Features

THE Balsa-Welin nesting lifeboat, manufactured by the American Balsa Company, Inc., Long Island City, N. Y., is a new nesting type boat which, as a result of holding sheer line and keel line parallel and rounding the bilges, can be nested closely together and readily launched.

The keel is built up of a flat outer keel, two angle bar keelsons and an apron plate between the keel and keelsons to which the shell plating is riveted.

The bottom shell is further strengthened by floors flanged to the shell plating and worked over the keelsons from bilge



Nesting Lifeboat

to bilge. These floors are also flanged at the top edge to take the footlings, thus giving a straight walking flat and allowing ample space between the shell and footlings to prevent the accumulation of dirt and rust.

The gunwales are of angle bar construction which increases the strength, durability and rigidity of the boat. As the drop leg of the angle bar is worked on the outside of the shell plating, moisture is excluded from the joint and the rusting away of the sheer strake is avoided.

The addition of floors flanged to the shell plating and the installation of angle bar gunwales have resulted in a boat so strong and rigid that in suspension tests the keel deflection is so little that it cannot be measured.

Germans Are Operating Large Motor Sailing Vessels

ACCORDING to a report recently received by the Department of Commerce, several German shipping companies have adopted the policy of building and operating large motor sailing vessels. In former times the installation of motors was restricted to small sailing vessels, but after the seizure of the German sea-going steamers by the allies it was decided that the quickest and least expensive way to increase the efficiency of the German merchant marine would be to install internal combustion engines on the large German sailing ships.

The quick journeys, especially to the West Coast of South America, which large German sailing vessels achieved before the war were remarkable, and the records of these ships were admired everywhere. A large part of their success is attributed to the Deutsche Seewarte (German Observatory), whose sailing manuals, monthly charts and other publications regarding sailing voyages have enabled commanders to choose the most advantageous routes for their trips and take advantage of favorable weather conditions.

The Deutsche Seewarte is also willing to train in a short time, and free of charge, captains and officers of vessels so that they will be able to judge meteorological conditions at sea. This knowledge is especially important to masters of motor sailing vessels in order that they may get the best results out of weather conditions. It will enable them to judge when it is best to use the sails alone, the motor alone or a combination of both.



General View of Simpson Dry Dock Plant, Looking Towards Main Ship Channel in Boston Harbor. In the Center Is the Power House and Pump Room, at the Right the 455-Foot Dry Dock, at the Left the 256-Foot Dry Dock (Unwatered)

Simpson's Patent Dry Dock Company of Boston Merged With Bethlehem Shipbuilding Corporation, Ltd.

THE recent acquisition of the plant of Simpson's Patent Dry Dock Company at East Boston, Mass., by the Bethlehem Shipbuilding Corporation, Ltd., marks another chapter in the history of one of the old ship repairing yards in New England. The history of this plant goes back to the days when the American clipper ships were carrying the American flag to all the ports of the world, and when American bottoms were carrying a large part of the commerce of the world.

The first dry dock, on Marginal street, East Boston, was built in 1853. Three years later the dry dock was purchased

by James Simpson, who established Simpson's Patent Dry Dock Company. Before the Civil War this dry dock was busy with repair work on clipper ships, and during the war much repair work on naval vessels was performed. It is said that the famous ship *Kearsarge*, after the engagement in which it put the Confederate commerce destroyer *Alabama* out of commission, came to this dry dock for repairs and was put into fighting trim.

Due to the growth of this business two other dry docks have been built, so that at present the docking facilities include one dock 455 feet long by 81 feet wide, one 256 feet long by 67 feet wide, and a small dock especially suited for tugs, fishing vessels and other small craft, 164 feet in length by 44 feet wide.

Equipment for doing repair work has been added to the plant as it has been developed. Recently a new power and pump house was built; also a well-equipped, modern machine shop. Other shops and equipment available for making all sorts of marine repairs include a boiler shop, paint shop, carpenter shop, blacksmith shop, derricks, etc.

Many well known vessels have been repaired at these docks. During the war a number of German vessels that had been injured by their crews after being interned were repaired here. Among these were the *Willehad*; the *Wittekind*; the *Ockenfels*; the *Iguassa*, a German boat interned in Rio de Janeiro and purchased by an American firm; and the *Don Juan de Austria*, once the private yacht of the Queen of Spain, now a United States Government boat.

This plant will be continued as a separate and complete repair yard by Bethlehem Shipbuilding Corporation, Ltd., and will be known as the Simpson Dry Dock Plant. S. W. Wakeman, general manager of the Fore River plant, has also been appointed general manager of the Simpson Dry Dock Plant.

The operation of this plant gives Bethlehem ship repair facilities centrally located in Boston Harbor, and in co-operation with the company's organization and equipment at Fore River, offers to the shipping industry means for complete service for ship repairing or shipbuilding.



Dry Docks of the Simpson Dry Dock Plant Looking Landward From Deck of Vessel. The 164-Foot Dry Dock is in Center, Between the 455-Foot Dock (at Left) and the 256-Foot Dock (Unwatered) at the Right

Largest Floating Dry Dock in the World Ordered

**All Steel Structure of Sectional Type 960 Feet Long
Will Be Able to Lift Vessel of 60,000 Tons Displacement**

SOUTHAMPTON, England, is to have the largest dry dock of its kind in the world. This dock, the plans of which are shown on the opposite page, will lift a vessel weighing 60,000 tons. As the docking weight of the *Majestic*, the largest ship in the world today, is only 52,000 tons, Southampton will be one of the few ports capable of docking any vessel that is likely to be built for some time to come.

The contract for the construction of the dock has been placed with Messrs. Sir W. G. Armstrong, Whitworth and Company, Ltd., Newcastle-on-Tyne, who will build it ac-

to list, it will be possible to correct it immediately by allowing some of the pumps to work faster than the others.

CENTRAL CONTROL

All of the pumps will be under the control of one man situated in the operating house on top of one of the wings. The valve operating mechanism and recording instruments will be installed in this house so that the operator will be able at all times to ascertain the true level of the dock and how deep she is below the water level at any particular point.

OTHER MACHINERY

The dock will also be equipped with many other appliances, including machinery for supplying compressed air, water pumps for fire service, and cleaning down, electric capstans for warping and hauling and traveling cranes for handling materials and equipment.

A site for the dock has already been selected and dredging operations have commenced. It will necessitate the deepest dredging ever performed, reaching to a depth of 75 feet at high water and 62 feet at low water. The amount of soil to be removed will aggregate 2,000,000 tons.

The dock will be placed quite near to one of the existing quays and two bridges will be provided by means of which the men engaged in repair work will be able to gain access to their work. A large floating crane is also contemplated which will be capable of lifting 75 tons by means of which heavy pieces of machinery can be placed aboard the vessel when she is in drydock.

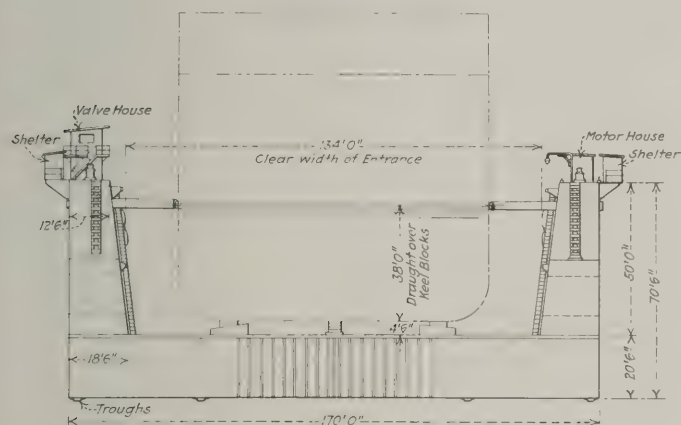


Fig. 2.—End Elevation of 60,000-Ton Floating Dry Dock

cording to the plans of Messrs. Clark and Standfield, a firm of engineers that is responsible for the construction of many large floating docks in England and elsewhere.

CHARACTERISTICS

Length overall	960 feet 0 inches
Length over pontoons	856 feet 6 inches
Breadth of pontoons	170 feet 0 inches
Depth of pontoons	20 feet 6 inches
Depth of side walls	50 feet 0 inches
Depth overall	70 feet 6 inches
Length of side walls	756 feet 6 inches
Width of side walls at base	18 feet 6 inches
Width of side walls at top	12 feet 6 inches
Clear width of entrance	134 feet 0 inches
Height of keel blocks	4 feet 6 inches
Draft of water over keel blocks	38 feet 0 inches
Depth of water required at site	65 feet 0 inches
Lifting power	60,000 tons
Weight of steel, about	16,200 tons
Light weight of dock, about	18,000 tons

PUMPING MACHINERY DETAILS

Fourteen motor-driven centrifugal pumps will be installed having a total capacity of 20,000 tons of water per hour. A maximum of 80,000 tons of water will need to be ejected requiring 4 hours' time. Shore stations will supply the electricity to operate the pumps and other machinery.

One of the special features of the dock is the installation of 4 mechanical shores. By means of these shores a vessel entering the dock can be quickly centered over the keel blocks.

Another special feature is the arrangement that has been made to control the level of the dock while she is being pumped out. Each of the fourteen pumps will be placed in a separate watertight compartment and so, if the dock starts

Kendell Piston Rings

KENDELL piston rings which have recently been placed on the marine market by the Kendell Engineering Corporation, Fort Wayne, Ind., are of two-piece construction, an inner or expansion ring and an outer or packing



Two-Piece Piston Ring

ring. A special analysis iron is used, which after having been thoroughly seasoned is further improved by a special returning process on the expansion ring, producing what is termed an "even-radius" type ring, having equiradial expansion every 30 degrees on the

entire circle, all points having equal pressure. This is especially beneficial in slightly out-of-round cylinders. A non-clogging oil wiper is also provided in this section of the ring.

The outer or packing section of the ring is of softer non-resilient iron, being turned with an inner surface on a 55-degree angle, the expansion ring having an externally inclined face of the same angularity, thereby relieving groove pressure and increasing pressure on the circumference, lengthening the life of the expansion ring. This has also proven to be a non-carboning feature.

Relative Economy of Steam and Motor Vessels

Comparison of 10,000-Ton Steamship and Motorship for Voyages of 5,000 and 10,000 Miles

By Lawrence B. Chapman*

COMPARISONS of the steamship and motorship have been published from time to time but in nearly all cases the writers have attempted to prove the superiority of one type. Consequently the assumptions made and the figures used have always been favorable to one type and as a result the whole comparison has been biased and the conclusions reached untrue. Too often the comparison is made wholly on fuel costs and no allowance made for difference in cargo deadweight. In the following comparison the writer has no desire to prove the superiority of either type, his purpose being only to learn the truth regarding the motorship. Great care has been exercised in collecting the data, to make it as accurate as possible, and while certain assumptions have been made for the hypothetical case these favor neither type. As far as possible all data used have been obtained by sound scientific calculations.

MAIN PARTICULARS OF THE SHIPS

The ships chosen for the comparison are of exactly the same dimensions, namely:

Length between perpendiculars.....	420 feet
Beam	60 feet
Depth	35 feet 6 inches
Draft	26 feet

The block coefficient used is 0.78, giving each ship a load displacement of 14,600 tons. The sea speed is $11\frac{1}{2}$ knots and the net tonnage 4,750 tons. The steamship is fitted with a geared turbine, watertube boilers and uses fuel oil; the motorship is fitted with 2 four cycle engines.

The data for the ships are given in Table I, which has been taken with slight modification from the writer's book, "The Marine Power Plant."

The effective horsepower was carefully figured from Robertson's data and increased 10 percent for margin. In the motorship, which is twin screw, the effective horsepower was increased by 40 horsepower to allow for struts. The propeller revolutions per minute have been taken as 90 for the single screw geared turbine ship and 115 for the twin screw Diesel ship. These values represent present day practice. The propeller efficiencies were obtained from Taylor's charts using the revolutions per minute mentioned and wake values of 0.31 for the single screw ship and 0.23 for the twin screw ship. The propulsive coefficients were obtained by multiplying the propeller efficiency by the hull efficiency; the latter being 1.05 in the case of the steamship and 1.00 for the motorship.

The values used for steam pressure, superheat, vacuum and feed temperatures are given in the table. The steam per horsepower per hour is:

$$w_a = \frac{2545}{H_1 - H_2} \times \frac{1}{\text{efficiency ratio}}$$

$$= \frac{2545}{388 \times .63} = 10.40 \text{ pounds per shaft horsepower per hour}$$

Allowing 25 percent for auxiliaries, the total hourly steam consumption becomes 38,800 pounds. This allowance for auxiliaries assumes that the make-up feed is obtained by using an evaporator, hence only a small amount (2 percent) of feed water is carried.

FUEL CONSUMPTION

In order to obtain the fuel oil consumption of the steamship, a boiler efficiency of 90 percent of that obtained on tests was used to give the theoretical trial value. The theoretical trial fuel consumption for the motorship was taken as 0.42 pound per hour, which is the commonly accepted rate. As shown in Table II these theoretical trial fuel consumptions were increased 10 percent for the steamship and 5 percent for the motorship in order to get fuel consumption in service. While these percentage increases over trial conditions may be rather small for average service at sea, moderate increases over those used will affect the comparison very little, provided the percentage increase for the motorship is allowed as about half that of the steamship.

The weights given in the table were obtained from detailed calculations, the weights of the prime movers being obtained from the manufacturer in each case. The lengths of the machinery spaces are from detail layouts of main engines and all auxiliaries. The gross tonnage for each ship was the same, as the total double bottom was considered available for fuel oil. The machinery spaces in each case came above 13 percent; hence the net tonnage is the same for both ships. The weights and costs of machinery are for total machinery and include main and auxiliary generating sets.

TABLE I

	Steamship	Motorship
1. Model effective horsepower + 10 percent..	1,720	1,760
2. Number of screws (3 bladed).....	1	2
3. Propeller revolutions per minute.....	90	115
4. Propeller efficiency	0.550	0.605
5. Propulsive coefficient	0.577	0.605
6. Shaft horsepower	2,980	2,910
7. Boiler pressure (gage)	250	.....
8. Superheat (degrees F.)	100	.....
9. Vacuum (inches, mercury)	28½	.....
10. $H_1 - q_2$ (feed = 218 degrees)	1,079	.....
11. $H_1 - H_2$	388	.....
12. Efficiency ratio	0.63	.....
13. Steam used by main engines (pounds per shaft horsepower per hour)	10.40	.....
14. Auxiliary steam (percent of main engine) ..	25 percent	.....
15. Total steam per hour	38,800	.....
16. Boiler efficiency in service	72 percent	.....
17. Rate of combustion (pounds per square foot heating surface per hour).....	.55	.....
18. Fuel per shaft horsepower per hour (trial condition)	1.03	0.42
19. Total fuel per hour (no reserve)	3,080	1,220
20. Length of engine and boiler rooms (feet) ..	50	55
21. Total weight of machinery and boilers (wet), tons	400	755
22. Weight of machinery (pounds per shaft horsepower per hour)	300	580
23. Feed water for 5,000 miles (2 percent carried), tons	150	.....
24. Consumable stores, crew and effects, (5,000 miles), tons	50	50
25. Calculated fuel for 5,000 miles + 20 percent reserve, tons	750	300
26. Calculated fuel for 10,000 miles + 20 percent reserve, tons	1,500	600

WEIGHT

The weight of the hull and equipment for both ships is 4,200 tons. Table I gives the weights of the machinery. The gross deadweights thus become:

*Professor of Naval Architecture, Lehigh University, Bethlehem, Pa.

TABLE II.—ANNUAL OPERATING EXPENSES (Based on a cargo of 0.75 percent deadweight capacity)

	Steamship 5,000 Miles		Motorship 10,000 Miles	
1. Gross deadweight	10,000	9,645	10,000	9,645
2. Cargo deadweight (item 1—fuel, stores and water)....	9,050	9,295	8,100	8,945
3. Sea speed (knots)	11½	11½	11½	11½
4. Net tonnage	4,750	4,750	4,750	4,750
5. Service fuel per shaft horsepower per hour.....	1.03 + 10 percent	.42 + 5 percent	1.03 + 10 percent	.42 + 5 percent
6. Days overhauling and lost per year	30	30	30	30
7. Rate of stevedoring (tons per hatch per hour).....	30	30	30	30
8. Rate of stevedoring (tons per 10 hour day).....	1,500	1,500	1,500	1,500
9. Days on run + 5 percent	19	19	38	38
10. Days in port + 10 percent	10	10.2	8.9	9.85
11. Days per single trip	29	29.2	46.9	47.85
12. Single trips per year	11.53	11.3	7.15	7.00
13. Initial cost of hull and equipment	\$700,000	\$720,000*	\$700,000	\$720,000*
14. Initial cost of machinery	300,000	480,000	300,000	480,000
15. Initial cost of ship complete	1,000,000	1,200,000	1,000,000	1,200,000
16. Tons carried per year at 75 percent deadweight capacity	78,300	78,800	43,500	47,000
Annual Expenses				
17. Depreciation (5 percent)	\$50,000	\$60,000	\$50,000	60,000
18. Insurance on hull and machinery (5 percent).....	50,000	60,000	50,000	60,000
19. Repairs, maintenance and overhauling (5 percent)....	50,000	60,000	50,000	60,000
20. Profit 10 percent on investment (10 percent).....	100,000	120,000	100,000	120,000
21. Total capital charges (25 percent)	\$250,000	\$300,000	\$250,000	\$300,000
22. Fuel used at sea and in port	87,000	41,750	102,500	50,800
23. Lubricating oil and fresh water	3,000	3,820	6,000	7,640
24. Wages of crew	37,500	37,500	37,500	37,500
25. Subsistence of crew (70 cents per man per day).....	8,500	8,500	8,500	8,500
26. Tonnage dues and port charges	34,500	33,500	20,500	20,700
27. Brokerage and management at 50 cents per ton.....	39,000	39,400	22,750	23,500
28. Stevedoring of cargo at 70 cents per ton	110,000	110,500	61,000	65,800
29. Annual operating expenses (sum 17 to 28).....	\$569,500	\$575,000	\$508,750	\$514,440
30. Rate per ton cargo to give 10 percent return on investment	7.28	7.30	11.70	10.90

*\$20,000 additional cost added because of electric deck machinery.

Gross deadweight of steamship=14,600 — (4200+400)=10,000 tons.
Gross deadweight of motorship=14,600—(4200+755)= 9,645 tons.

The net cargo deadweights are given in Table II.

Table II gives the summary of annual operating expenses and freight rates to give a profit of 10 percent on the investment for steamship and motorship for voyages of 5,000 and 10,000 miles. This table is based on an average cargo equal to 75 percent of the deadweight capacity in each case. While profit is in reality not an operating expense and most accountants today do not include interest on investment as an operating expense, it was thought best to arrange the work in this way in order to give the comparison on freight rates.

The calculated time at sea has been increased 5 percent to allow for bad weather and the calculated time in port for cargo handling has been increased 10 percent over that required to discharge and receive the cargo, to allow for tides, holidays and general delay. Thirty days per year have been allowed for docking, overhauling, painting, etc.

Table III gives the cost of crew together with their monthly wages. The wages have been kept the same for both ships. As a matter of fact, however, those for the motorship would be slightly higher as there would be two motormen per watch or one motorman and one electrician instead of one oiler and one fireman.

Fuel oil for the steamship has been assumed at \$1.50 a barrel and 8 pounds per gallon; Diesel oil has been assumed at 4½ cents per gallon (\$1.88 per barrel) and 7.35 pounds per gallon. Port fuel for heating, lighting and operating the winches has been taken as 7 tons per day for the steamship and one ton for the motorship.

TABLE III.—Crew's Monthly Wages (United States Shipping Board Scale, effective April, 1922).

Master	\$300
First Officer	165
Second Officer	145

Third Officer	130
Carpenter	65
Able seaman (7) at \$55	385
Ordinary seaman (3) at \$40	120
Radio operators (2) at \$90	180

Deck department (17)	\$1,490
Chief engineer	\$240
First assistant	165
Second assistant	145
Third assistant	130
Deck engineer	70
Oilers (3)	195
Firemen or motormen (3) at \$57½	172.50
Wipers (3) at \$50	150

Engine department (14)	\$1,267.50
Steward	\$105
Cook	90
Second cook	70
Mess boys (3)	105

Steward's department (6)	\$370
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Total per year=\$37,500.
(\$3,127.50 per month.)

CALCULATIONS FOR STEAMSHIP

Calculations for the steamship on the 5,000 mile voyage follow:

8. Rate of stevedoring at 30 tons per hatch per hour =
$$30 \times 5 \text{ hatches} \times 10 \text{ hours} = 1,500 \text{ tons per day.}$$
9. Days on run = $\frac{11.5 \times 24}{9050 \text{ tons} \times 2 \times 0.75} \times 1.05 = 19 \text{ days.}$
10. Days in port = $\frac{1500}{365 - 30} \times 1.10 = 10 \text{ days}$
12. Single trips per year = $\frac{10 + 19}{11.53} = 11.53 \text{ trips.}$

16. Tons carried per year = $9050 \times 11.53 \times 75$ percent = 78,300 tons.
22. Fuel used at sea = $\frac{2980 \times 1.03 \times 19 \times 24}{2240} \times 1.10 = 688$ tons.
- Fuel used in port = $10 \times 7 = 70$
Total fuel per single trip, 758 tons
Cost of fuel per year = $758 \times 11.53 \times \$9.95 = \$87,000$
23. Lubricating oil, at 1 gallon per 10,000 shaft horsepower hours,
 $\frac{2980 \times 19 \times 24 \times 11.53}{10,000} = 1,570$ gallons per year.
- Cost of lubricating oil per year at 75 cents a gallon
= $1570 \times 0.75 = \$1,175$.
- Cost of feed water = $150 \times 11.53 \times \$1.00 = \$1,725$.
(Lubricating oil for the motorship was allowed for as 1 gallon per 3,000 shaft horsepower hours.)
26. Port charges:
- | | |
|------------------------------------|---------------|
| Pilotage (inward and outward)..... | \$273 |
| Towage (inward and outward)..... | 200 |
| Miscellaneous fees | 100 |
| Cooperage and dunnage | 300 |
| Clerks, watchmen, etc. | 200 |
| | <hr/> \$1,073 |
- Dockage at 2 cents per ton per day = $4,750 \times 11.53 \times 10 \times .02 = \$11,000$
- Tonnage dues at (6 cents and 34 cents $\times 4,750 \times 11.53 \times .20 = 11,000$
- Miscellaneous, (as above) = $1,073 \times 11.53 = 12,500$
- Port charges per year = \$34,500
28. Stevedoring of cargo = $78,300 \text{ tons} \times 2 \times \$0.70 = \$110,000$

CONCLUSION

The foregoing calculations which have been carried through in an impartial manner show that the steamship can carry cargo on the 5,000 mile voyage at \$7.28 per ton against \$7.30 per ton for the motorship. Thus there is a gain of 2 cents per ton in favor of the steamship.

A study of the main groups of operating expenses will clearly show why the motorship is at a disadvantage. All the groups are practically identical except group 21 (capital charges) and group 22 (fuel oil). While the motorship uses only 40 percent of the fuel that the steamship uses, the cost per gallon today is about 25 percent higher.

MOTORSHIP GAINS ON THE LONG VOYAGE

On the 10,000 mile voyage the motorship shows up decidedly superior to the steamship. For voyages greater than 10,000 miles there is no doubt that the motorship would prove its superiority over the steamship.

The foregoing comparison shows that the motorship is at a disadvantage because of the higher first cost. Twenty-five percent of this original cost appears in the annual operating expenses as capital charges (item 21). The capital charges for the motorship for both the 5,000 and 10,000 mile voyages are \$50,000 a year higher than the steamship, while the fuel costs for the motorship per year are only \$45,000 and \$50,000 less.

It would appear from the foregoing calculations that there is no gain in adopting the motorship for voyages less than 6,000 or 7,000 miles, unless the first cost of the Diesel engine can be reduced. This first cost will no doubt be reduced somewhat in the future due to standardization and increased experience. However, it hardly seems probable that the motorship will replace the steamship to any large extent until a cheaper design of Diesel engine is produced. The real solution in the opinion of the writer is the adoption of the two cycle engine. This will reduce the weight and consequently the cost of the engine, allowing the motorship to carry considerable more cargo than the steamship. This additional cargo together with cheaper fuel bill and lower capital charges will place the motorship ahead of the steamship even on short voyages.

If added experience allows the Diesel engine to use boiler fuel oil instead of the lighter Diesel oils, the operating costs of the motorship will be further reduced.

The machinery layouts clearly show that the Diesel machinery occupies slightly more space than the steam machinery although the general impression is that the motorship is superior to the steamship in this regard. With the adoption of the two cycle engine a considerable gain in cargo space will result.

Statements have often been made that the motorship carries more cargo per annum than the steamship but a study of Table II shows that for a 5,000 mile voyage the cargo carried per year is practically the same for the two types. This of course is due to the fact that the increased weight of the Diesel machinery (see items 21 and 22, Table I) more than offsets the reduction in fuel weight. On the 10,000 mile voyage the cargo carried by the motorship is considerably in excess of the steamship due to the lower fuel weight.

Table IV shows the operating expense groups arranged as percentages of the total annual operating expenses.

TABLE IV.—OPERATING EXPENSES

Operating Expenses	5,000 mile voyage		10,000 mile voyage	
	Steam-ship	Motor-ship	Steam-ship	Motor-ship
1. Capital charges (including profit)	44%	52%	49%	58½%
2. Fuel, lubricating oil and water	16	8	21½	11
3. Crew and subsistence.....	8	8	9	9
4. Brokerage and management	7	7	4½	4½
5. Port charges	6	6	4	4
6. Stevedoring of cargo	19	19	12	13
	100%	100%	100%	100%

Table IV clearly shows the relative importance of the items making up the operating expenses. Compared to capital charges and stevedoring, the fuel costs are relatively unimportant. It is seen that the Diesel engine loses out on the short voyage because of the large increase in group 1. This table is very significant in that it shows that the successful ship of the immediate future is not one in which fuel or crew wages are reduced so much as the one with the lower first cost and lower stevedoring charges. These last two items make up roughly 70 percent of the entire operating expenses—surely a field for searching investigation.

It is interesting to note in Table II that the annual operating expenses are less on the longer voyage than on the shorter voyage. This is due to the greater saving in cargo handling, which is practically cut in half on the longer voyage. The capital charges and fuel costs remain practically the same for both voyages. The Diesel wins out on the longer voyage because of the larger cargo carried, due to the reduced fuel and feed water weight and not because of the saving in fuel costs.

The figures and data used in the above comparison are for a hypothetical ship of 10,000 tons deadweight and of course do not apply to all cases. The figures do, however, represent general practice and small changes in any of the items will not affect the broad conclusion, namely, that a 10,000 ton motorship shows no gain over the steamship fitted with the most up-to-date power plant, for voyages under 6,000 miles. Changes in the size and speed of the ship will, of course, influence the result.

It may be that the repairs and maintenance charges for the motorship may eventually turn out to be lower than those of the steamship but until actual figures are available covering a period of years we are not warranted in favoring the motorship in the comparison.

EFFECT OF MODIFICATIONS IN THE DATA

If actual costs are available for Diesel machinery and fuel that differ from those used in the above comparison, modifications may be readily made in the table to get a com-

parison. Thus, for instance, if two cycle engines are available at a cost for total installations of \$380,000 and with a total machinery weight of 450 pounds per shaft horsepower the following changes will result:

Total cost of ship, \$720,000 + 380,000 =	\$1,100,000
Approximate increase in fuel and lubricating oil per year	\$4,000
Saving in capital charges per year	\$25,000
Saving in machinery weight	170 tons
Increase in cargo carried per year	1,500 tons
170 × 11.53 × .75 =	80,300 tons
Total cargo carried per year	80,300 tons
Annual operating expenses (\$575,000 — \$21,000)	\$554,000
Rate per ton	\$6.90

For the above conditions the motorship would be superior to the steamship on the 5,000 mile voyage.

If Diesel fuel can be purchased at a rate less than one and a quarter that of boiler fuel, the motorship and steamship will be nearly equal on the 5,000 mile voyage.

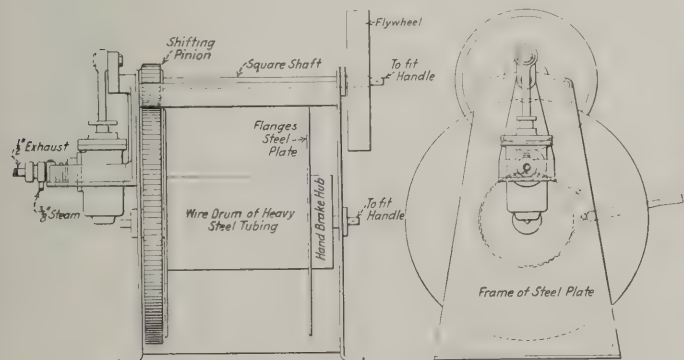
Further, if Scotch boilers are used in place of watertube boilers, the cost of the steamship will be slightly greater and the cargo carried per year about 900 tons less. This will be to the advantage of the motorship in the comparison.

Developments in the future, such as standardization, the adoption of the two cycle engine and the use of poorer grades of fuel in the Diesel engine, will reduce the length of voyage at which the steamship and motorship show the same annual operating costs. On the other hand, the adoption of Diesel machinery is bound to force those interested in steam machinery to improve the economy and efficiency of the steam plant, so that any gain to the advantage of the motorship is likely to be met by gains to the advantage of the steamship. In general, for ships of about 10,000 tons deadweight, the motorship will probably be largely adopted for voyages over 5,000 miles and for powers under 10,000 shaft horsepower, and the steamship for all voyages of 5,000 miles and less and for the fast and high powered ships.

It should be clearly borne in mind that the above comparison is for a 10,000 ton cargo ship on a given length of voyage at a speed of 11½ knots and the conclusions arrived at are for a specific case only.

New Steam Operated Reel for Use With Snubbing Wire on Canal Steamers

IN response to a demand for a steam operated reel for use with snubbing wire on canal steamers, the Montreal Drydocks and Ship Repairing Company, Ltd., Montreal, Can., has designed and successfully tried out the "Little Snubber" with engine attached, which is shown in the illustration. The reel is safe to operate and is not overpowered, being designed for operating from 40 to 180 pounds steam to



"Little Snubber" Steam Operated Reel

pull in the slack snubbing wire only. The reel can be operated by hand in single or double gear, if desired, without any change, and cable paid out on the brake.

A compact design of engine has been evolved which is easily overhauled and repaired, has large bearing surfaces and stows neatly away without taking up any more deck space than the ordinary hand reel. The whole outfit is relatively inexpensive and, if desired, the engine alone can be furnished for connecting to hand reels at little expense.

The gears are the only parts not of steel, and all shafts are square so that new gears can be slipped on as they come from the foundry and with no labor whatever in boring, keyseating, fitting, etc.

Concentration Salinity Indicator

THE newest development along the lines of the instantaneous determination of the chlorine content in a ship's water system has taken the form of a signal light controller. This apparatus, known as the Concentration Salinity Indicator, which is handled by The Babcock & Wilcox Company, New York, indicates automatically and instantaneously an increase in the density by showing various colored lights, a white light for 0.5 grain, a green light for 0.5 to 5 grains and a red light for a density over 5 grains. This is an especially valuable feature in connection with the evaporator room, as an instantaneous warning is given when the quality of the distillate changes, thus obviating the possibility of running considerable poor water.

The signal light controller also keeps a most accurate check on the condenser, which is an important feature for merchant vessels. A continuous indication of the quality of the condensate is shown at all times, the warning lights showing as in the case of the evaporator, but with a slightly different range. The white light shows a density up to 0.3 grain, the green light shows from 0.3 up to 1 grain, and the red light shows above 1 grain.

As a result of tests made on the United States battleship *Tennessee* for over a year under actual operating conditions,

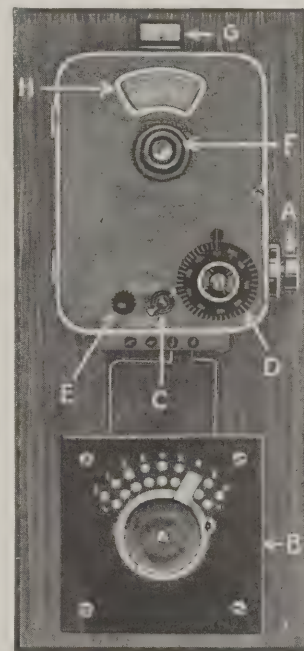


Fig. 1.—Concentration Indicator and Selector Switch

the Concentration Salinity Indicator was installed on the battleships *Maryland* and *Nevada*, and subsequent to these installations the United States Navy has ordered complete sets for battleships, cruisers, scout cruisers and supply ships.

Indicators are also being installed

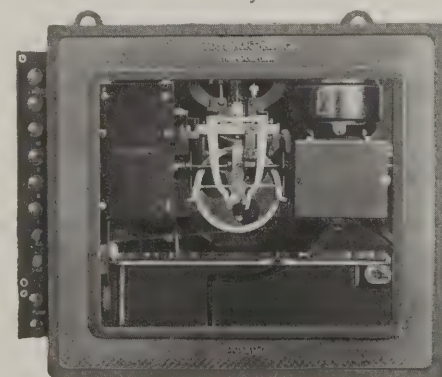


Fig. 2.—Signal Light Controller

on the S.S. *Leviathan* and on three New York City ferry boats.



Additional Views of Exhibits at the Marine Exposition, Grand Central Palace, New York, November 4-11, 1922

Ropes, Chains and Blocks for Shipbuilding Purposes—II

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials' point of view.

Davit guys and spans are preferably of wire rope, about $\frac{5}{8}$ -inch diameter. As no great flexibility is required, a 6 by 7 construction will suffice.

Lifeboat operating gear of vessels under the jurisdiction of the United States Steamboat Inspection Service has to meet with their approval.

DAVITS

Boat davit falls should be as flexible as possible. Where wire rope is used, this means the type of rope that will have maximum strength with minimum diameter and also a rope made up of fine individual wires. For ropes smaller than $\frac{1}{2}$ -inch a galvanized plow steel rope, of 8 by 19 construction, with ultimate strength about 90 percent of that given in Table IV, and of the diameter necessary to take care of the weight with a factor of safety of at least 5, is good practice. For ropes larger than $\frac{7}{16}$ -inch the 6 by 37 construction is desirable. Where the weights are moderate manila rope will answer.

Special shackles are required for boat davit blocks to take care of the connections at the davits and at the boats, with ample spread of jaw and ample distance between the base of the jaw and the center line of the pin. A swivel jaw shackle is desirable for the upper blocks and a regular jaw shackle for the lower blocks. Eight-inch double blocks are a good size for 3-inch circumference manila falls and 7-inch for $2\frac{1}{4}$ -inch circumference falls. Brass roller bushings are desirable.

EQUIPMENT

Anchor cables, stream lines, mooring lines and towlines, together with the anchors, form the so-called equipment of a vessel. Where a vessel is classed, all important particulars of the equipment are definitely specified by the classification society concerned and the cables are regularly tested by them. The equipment of such vessels has to be ordered in accordance with their requirements as to length, size, etc., and those who furnish it should be advised that it has to meet classification society approval.

The classification societies may be expected to approve for schooner barges and other craft that do not exactly come under their rules for steam or sailing vessels equipment that is in line with good practice even though it is not up to the standard determined by a strict application of their rules.

A good equipment is very important for the safety of the ship and all on board of her; and even where a vessel is not classed, classification society requirements should receive careful consideration in the selection of that equipment.

Wire rope equipment lines should be specified to be delivered on individual reels for each length, the reel being marked with the number of strands and wires per strand, the size of rope, the length of rope and the name of the manufacturer. All unworked ends of the ropes should have three servings or wrapping tightly applied.

The stream line should be of galvanized steel wire rope, preferably having 6 strands around a hemp center, with a hemp center and 24 wires to each strand. This may be

designated as the 6 by 24 construction with 7 hemp centers. It should have a galvanized hawser thimble spliced in one end. The strength should be in accordance with Table I.

The towline may be of wire rope or fiber rope. If the former on steamships and sailing vessels, it is preferably of the same nature as the above mentioned stream line, but with a galvanized hawser, thimble spliced in one end and a long spliced eye or loop in the other.

Wire rope towlines for seagoing barges are generally used in conjunction with towing engines and should have greater strength for their size than the 7 hemp center ropes so as to take up less space on the drums. For this service galvanized steel towing hawsers of 6 by 37 construction with one hemp center are preferable. A customary size is $1\frac{1}{4}$ -inch diameter and this size should have an ultimate strength of 108,000 pounds. It is desirable that such hawsers have a heart shaped cringle rove in the outboard end. They should be served back for 5 feet with galvanized annealed steel seizing wire. These lines are a part of the tugboat equipment. Fiber rope towlines for barges, which form a part of the barge equipment, are preferably of the strongest and highest grade manila because when a barge breaks adrift from its tow it is largely at the mercy of the elements. Bolt rope is therefore the rope to use. A 9-inch manila bolt rope towline should have a strength in excess of 65,000 pounds.

"Durable" wire rope towlines are of the 5 by 19 construction.

Wire rope hawsers, mooring lines and warps are preferably of the same construction as specified for stream lines, but having a long spliced eye or loop in one end. "Durable" wire rope hawsers are usually of the cable laid construction made up of five 5 by 7 ropes.

Chains should be in accordance with classification society requirements as to size, strength, size of links, etc. They should be coated with an approved protective covering. Anchor chain cables should be ordered complete with connecting and anchor shackles; and to insure that all connecting shackles will lead the same way over the windlass wildcat there should be an odd number of links in each length of chain. It is very important that the chain links and the wildcats match up. It is advisable to order with every suit of two anchor chains for ocean going vessels two spare anchor shackles and two spare connecting shackles complete and also two spare anchor shackle pins and four spare connecting shackle pins. All keeper pins in shackle pins should be of brass so that they may be readily renewed.

GANTLINES

Manila rope $1\frac{1}{2}$ -inch circumference will answer for this, with 6-inch single wood block with shackle to suit the connection and graphite bronze bushing.

HEAVING LINES

Ratline is used for this service.

LADDERS

Wire rope for ladders should be medium flexible and is preferably of 6 by 12 construction. Fiber ropes can be as specified under manropes.

* Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

LANYARDS

The usual rope for this service is 4-strand tarred hemp rope.

LASHINGS

Lashings for spare propellers, anchors, etc., of considerable weight are preferably of flexible wire rope.

Fiber rope lashings for boats, small anchors, etc., and for general use about the vessel are preferably ratline.

Chains are used in some cases but are subject to excessive corrosion.

LEAD LINES

Lead lines are generally of cotton braided around a cotton center. They are smooth, flexible and have a polished surface. They are designated by a number which indicates the diameter in 32nds of an inch. The size is to suit the weight of the lead. For a 7 or 9 pound lead it may be No. 8, or 8/32-inch diameter, which runs about 44 feet to the pound and should have an average breaking strength of 300 pounds; for a 14 or 20 pound lead it may be No. 9, which runs about 36 feet to the pound and should have an average breaking strength of 400 pounds. For a 50 pound lead it may be No. 12, which runs about 20 feet to the pound and should have an average breaking strength of 700 pounds.

The Navy Department uses a braided cotton line 5/8-inch circumference for a boat's lead line, a braided flax line 1-inch circumference for a coasting lead line and a plain laid American hemp line 1 1/2-inch circumference for a deep sea lead line.

An untarred hemp line 3/4-inch circumference will answer for a hand lead line.

Hand lead lines are marked as follows, and should be well soaked before being marked:

- At 2 fathoms from the lead, with 2 strips of leather.
- At 3 fathoms from the lead, with 3 strips of leather.
- At 5 fathoms from the lead, with a white rag.
- At 7 fathoms from the lead, with a red rag.
- At 10 fathoms from the lead, with leather having a hole in it.
- At 13 fathoms from the lead, same as at 3.
- At 15 fathoms from the lead, same as at 5.
- At 17 fathoms from the lead, same as at 7.
- At 20 fathoms from the lead, with two knots.
- At 25 fathoms from the lead, with one knot.
- At 30 fathoms from the lead, with three knots.

The pieces of leather and rag as well as the pieces of cord in which the knots are to be tied for the 20, 25 and 30 fathom points should be securely attached to the line by a wrapping of waxed twine which is drawn through the cord once at the end.

The lead may be attached either by passing the line through the eye of the lead, knotting the line and securing the loose end by waxed cord, or, if the size of the eye permits, by making a long loop at the end of the line which can be threaded through the eye and passed over the end of the lead. Due allowance should be made, in securing the fathom markings, for the length of the lead and the methods of its attachment.

LIFEBOAT LINES

Lifeboats and life-rafts on all vessels under the jurisdiction of the United States Steamboat Inspection Service are required to be fitted with ropes as called for and approved by them. The painter for sea going vessel service has to be of manila rope not less than 2 3/4-inch circumference and of suitable length.

LIFE LINES

Lines for line carrying guns have to meet the approval of the United States Steamboat Inspection Service. They must be not less than 1,700 feet long and be capable of withstanding a breaking strain of 500 pounds. Life buoy lines are also subject to the same approval.

LIMBER CHAINS

Limber chains are usually 3/8-inch galvanized short link chains. A twisted link chain is preferable, and in large vessels a 7/16-inch chain is advisable.

LOG LINES

Log lines are the same as the cotton lead lines. The usual size is No. 8.

MANROPE

These are hand ropes and grab ropes of various kinds. A 6 by 19 galvanized wire rope is suitable. A good fiber rope for this service is the 4-strand tarred hemp rope, 2-inch or 2 1/4-inch circumference. It is frequently wormed, parcellled, covered with canvas and painted.

RAILINGS

Wire rope used as railings is preferably of the nature specified for awnings.

Chain used as railings in way of gangways, etc., or for portable railings around hatches can generally be 3/8-inch galvanized short link chain.

RATLINES

Ratlines are frequently made of iron; but where fiber rope is to be used this is the service for which ratline is particularly adapted.

RIGGING

The rigging on classed vessels is subject to classification society approval, and these societies have tabulated requirements for the standing rigging of sailing vessels.

The standing rigging does not require much flexibility and for sizes 1 1/2-inch diameter and less the 6 by 7 construction of wire rope is satisfactory. For greater diameters than 1 1/2-inch the 6 by 19 construction is preferable. It should be of galvanized cast steel with ultimate strength for the 6 by 7 rope as given in Table II, and for the 6 by 19 rope as given in Table III.

Wire rope running rigging should be as flexible as possible consistent with good wearing qualities. This calls for the use of the highest grade rope for such service as topping lifts, cargo hoists and davit falls, in order to keep the diameter as small as possible. The 8 by 19 plow steel rope is the most desirable and in the sizes required it should have an ultimate strength 90 percent of that given in Table IV for the 6 by 19 rope. Where it cannot be readily obtained the 6 by 19 rope of Table IV is suitable. For wireless halyards and similar service cast steel rope with an ultimate strength as given in Table V is satisfactory.

Running rigging is frequently galvanized although some of the manufacturers and users claim that the galvanizing is soon knocked off, leaving the rope in a worse condition than the ungalvanized rope. The writer is of the opinion that topping lifts should be galvanized and cargo hoists which are in frequent use not galvanized.

"Durable" wire rope for running rigging is of the 5 by 19 construction. It requires special sheaves and blocks.

Fiber rope for cargo operating is preferably a 4-strand manila rope with a heart, hard laid, and with tallow treated yarns. A special grade of manila rope is made for the running rigging of small boats, called yacht rope. The Navy Department recommends for the rapid handling of loads of about 900 pounds, such as coaling whips, a 4 1/2-inch circumference, 4-strand manila rope.

Fiber rope standing rigging is now practically obsolete except on small boats. A 4-strand tarred hemp rope is the type mainly used for this service. Running rigging is preferably the medium lay 3-strand manila.

A usual size for sails on steamships is 3-inch circumference for the sheets and halyards and 2 1/2-inch circumference for the downhauls. On large schooner rigged sailing vessels

Table VIII—Rigging for Cargo Handling—1 to 5 Tons Capacity

Name	Wire		ROPES		Manila		BLOCKS (a)						
			Wires	Galv.	No.		Diam.	Length	No.				
	Diam.	Circ.	Type	Strands	Per Strand	Circ.	Type	of Sheave	of Shell	of Sheaves	Shackle	Becket	Location
Topmast stay	3/4"	2 1/4"	Cast steel	6	7	Galv.	...	...	...	...	...	...	...
Back stay	3/4"	2 1/4"	Cast steel	6	7	Galv.	...	...	...	...	...	...	...
Shrouds	1 1/4"	4"	Cast steel	6	7	...	...	...	...	...	...	...	...
Topping lift	3/8"	2 3/4"	Plow steel	8	19	Galv.	...	...	...	...	...	...	...
Topping lift purchase	...	...	...	...	...	3 1/2"	3	{ Steel 16"	10"	Single	Regular	Without	Masthead
								{ Wood 6 1/4"	10"	Double	Upset	With	Upper
								{ Wood 6 1/4"	10"	Triple	Upset	Without	Lower
Cargo hoist, single whip	5/8"	2"	Plow steel	8	19	Not galv.	...	{ Steel 14"	...	Single	Regular	Without	Upper
								{ Steel 14"	...	Single	Regular	With (a)	Lead
Cargo hoist, with purchase	5/8"	2"	Plow steel	8	19	Not galv.	...	{ Steel 14"	...	Double	Regular	Without	Upper
								{ Steel 14"	...	Single	Regular	With	Lower
								{ Steel 14"	...	Single	Regular	With (a)	Lead
Vang pendant	5/8"	2"	Cast steel	6	7	Galv.	...	...	...	...	...	...	...
Vang purchase	...	...	...	...	...	3"	3	{ Wood 6 1/4"	10"	Double	Upset	Without	Upper
								{ Wood 6 1/4"	10"	Single	Upset	With	Lower

Rigging for Cargo Handling—30 Tons Capacity

Topmast stay	3/4"	2 1/4"	Cast steel	6	7	Galv.	...	...	...	...	...	...	...
Back stay	3/4"	2 1/4"	Cast steel	6	7	Galv.	...	...	...	...	...	...	...
Head stay	1 3/8"	4 1/4"	Plow steel	6	7	Galv.	...	...	...	...	...	...	...
Preventor stay	1 3/8"	4 1/4"	Plow steel	6	7	Galv.	...	...	...	...	...	...	...
Shrouds	1 3/8"	4 1/4"	Plow steel	6	7	Galv.	...	...	...	...	...	...	...
Topping lift	3/4"	2 1/4"	Plow steel	8	19	Galv.	...	{ Steel 18"	...	Triple	Regular	With	Masthead
								{ Steel 18"	...	Quad.	Regular	Without	Boom
								{ Steel 18"	...	Single	Regular	Without	Masthead
								{ Steel 18"	...	Single	Regular	With (a)	Deck
								{ Steel 18"	...	Triple	Regular	With	Upper purchase
Cargo hoist	3/4"	2 1/4"	Plow steel	8	19	Galv.	...	{ Steel 18"	(b)	Quad.	Regular	Without	Lower purchase
								{ Steel 18"	...	Single	Regular	Without	Masthead
								{ Steel 18"	...	Single	Regular	With	Deck
Vang pendant	7/8"	2 3/4"	Cast steel	6	7	Galv.	...	...	...	...	...	...	...
Vang purchase	...	...	...	...	...	3 1/2"	3	{ Wood 8"	12"	Triple	Upset	Without	Upper
								{ Wood 8"	12"	Double	Upset	With	Lower

(a) The becket is for a lashing.

(b) There is an additional 18 inch sheave in the end of the boom between the lower purchase block and the masthead block.

3 1/2-inch sheets, 3-inch halyards and 2 3/4-inch downhauls will usually answer for the jibs, and 4 1/2-inch sheets, 4-inch halyards and 3 1/2-inch downhauls for the principal sails.

When dealing with topping lifts it is well to bear in mind that they usually have to be handled over the gypsy head of the winch and also fastened around relatively small cleats. Wire rope is not so convenient to handle in such circumstances as fiber rope and the best arrangement is to have wire rope from the end of the boom to beyond the masthead block with a manila rope purchase from there on. There must be sufficient length of wire rope so that the end connection does not foul the masthead block when the boom is in its lowest position, and the lower block of the manila purchase has to be sufficiently low down to permit of the boom's being brought to the highest desired angle before the purchase blocks come block to block. Complete manila topping lifts are subject to undesirable stretch.

It has been customary with a number of the east coast naval architects and shipbuilders to use 1/2-inch plow steel rope for cargo whips on the ordinary run of freighters. This is flexible and therefore easy to handle and amply strong for the usual service. In many cases, however, stevedores on the west coast have refused to unload vessels thus equipped, demanding 5/8-inch hoisting ropes. The writer knows of one vessel in particular which met with this demand and not being able to obtain the 5/8-inch rope was obliged to fit out with a set of 3/4-inch cargo hoists before the cargo could be discharged. This is a point to be borne in mind in cases where the 1/2-inch rope appears to meet the requirements of the service.

Vang pendants should be about two-thirds the length of the boom.

Chain in rigging is met with principally in parts of the running rigging and the bowsprit shrouds of sailing vessels, and for the Burton sling method of cargo handling and cargo slings generally. The former are determined by classification society requirements, and the "Coil" grade of chain is frequently used. The latter are referred to under the head of slings. Chains are also used as topping lifts where booms attached to king posts or ventilators are not raised or lowered when in operation. In some cases a section of chain is attached to the end of the topping lift, with long links that

can be conveniently hooked over some anchorage, to hold the boom in the desired position.

Blocks are an item of considerable interest in connection with the rigging. The bushings should in all cases be of a good quality, such as self-lubricating graphite bronze. Cargo hoist blocks are preferably Metaline bushed. Where ropes passing over the blocks have a considerable change of direction in the course of their operation, care should be taken to select blocks that will permit this without fouling distance pieces or other parts of the blocks.

Table VIII gives in a concise manner data for the rigging of cargo masts and booms, representative of good practice, showing the approved materials and sizes, the relations between ropes and blocks, and other information. The 1 to 5 ton layout covers a pole mast with two shrouds port and starboard; and the topping lift is a one part wire rope with a manila purchase as before explained. The 30 ton layout covers a pole mast with one preventer stay, port and starboard, and three shrouds, port and starboard.

SEIZING

This, as its name implies, is a fastening and generally means the fastening together of parts of larger ropes such as anchor lashings, boat gripes, etc. The seizing rope before described is used for this. Tarred marline is also used for small seizing.

SERVING

The process of covering a rope with a smaller rope tightly wound around it is called serving. The rope is first generally wormed and then parcelled as later explained.

Tarred marline, houseline, roundline, hambroline and spun yarn are used for this. The last mentioned is preferable as it lies smooth under the serving mallet and makes a close fitting watertight covering. Ratline is used for heavy serving.

SIGNAL HALYARDS

Manila rope 1 1/8-inch circumference is frequently used for these on steamships, with 4-inch single wood blocks with regular shackles and graphite bronze bushings. Untarred hemp rope will answer, and on smaller vessels may be 1-inch or 3/4-inch circumference.

SLINGS

Wire rope slings of various kinds are preferably of the 6 by 37 construction. For cargo handling they are usually of 1-inch wire 30 feet long with a thimble in each end. Boat slings and slings of small diameter rope can be of the 8 by 19 construction.

Fiber rope slings are preferably of three strand common lay manila.

Chain slings are of galvanized short link chain. As made up for Burton slings for cargo handling they are preferably two 10-foot lengths of the highest grade short link chain connected by a ring at one end which takes the cargo hook and with a swivel and shackle at each of the other ends. A good size is 1-inch with a 4-inch inside diameter ring, 1 1/4-inch swivels and 1 1/8-inch shackles. Ordinary cargo slings are double and can be bought in any desired length with a ring at one end and hooks at the other. Standard lengths are 10 feet and standard sizes are 1-inch, 3/4-inch and 1/2-inch; all of the highest grade short link chain, galvanized.

STACK GUYS

Stack guys can be of galvanized cast steel wire rope, 6 by 7 construction, with ultimate strength as given in Table II. A suitable size for stacks as met with on the ordinary run of cargo steamships is 3/4-inch. They can also be of galvanized wire strand made up of 7 or 19 wires twisted together, the latter being used for the larger sizes.

Stack guys can also be of galvanized short link chain.

STEERING GEAR

Steering gear ropes require great flexibility, particularly where they are required to pass around drums or sheaves. The 6 by 37 construction of wire rope is often used, being of plow steel for transmission ropes and cast steel for tiller ropes. A special construction for this purpose consists of six small ropes around a hemp center, each rope being of the 6 by 7 construction with its own hemp center. These ropes can be obtained from 1/4-inch to 1-inch diameter.

The last mentioned rope, 3/8-inch diameter, is sometimes used for steam steering engine controls but stretches too much for such service. The regular 6 by 19 cast steel rope is satisfactory for these controls.

Bronze tiller ropes are used considerably on small vessels, and also braided cotton ropes with bronze or steel wire cord centers.

Fiber ropes are preferably 4-strand or 6-strand with heart, hard laid, and with tallow treated yarns. The 6-strand rope is the more flexible and better for work on steering wheel drums of small diameter.

Chain for steering leads is mainly used around the steering engine drum and in way of the quadrant, and is preferably the highest grade of short link chain. Rapid wear takes place in way of the sheaves. Backing chains are also short link chains.

Guide sheaves should fit the ropes or chains and be of ample size.

STORES

Stores, deck outfit, etc., for the ordinary run of cargo steamships should include about

- 120 fathoms of 1 1/8-inch circumference manila—3 strand.
- 120 fathoms of 1 1/2-inch circumference manila—3 strand.
- 120 fathoms of 2-inch circumference manila—3 strand.
- 240 fathoms of 2 1/4-inch circumference manila—3 strand.
- 480 fathoms of 2 1/2-inch circumference manila—3 strand.
- 480 fathoms of 3-inch circumference manila—3 strand.
- 2 coils of 9 thread manila—200 fathoms.
- 1 coil of 15 thread manila—200 fathoms.
- 20 pounds of 3-yarn spun yarn.
- 1,500 feet of plow steel wire rope of the size and construction used for cargo hoists, as spares.
- 1 chain sling 10 feet long—1-inch chain.
- 4 chain sling 10 feet long—3/4-inch chain.

1 chain sling 10 feet long—1/2-inch chain.

2 wire slings 30 feet long—1-inch wire, with thimbles in ends.

Spare anchor shackles as mentioned under equipment.

Blocks for stores should generally include the following, together with other spare blocks and sheaves that will meet the requirements of the particular service:

Purpose	No.	Size	Type	Hook	Becket	Bushing
Lead gear	2	8-inch	wood-double	loose	with	graphite-bronze
Lead gear	2	8-inch	wood-double	loose	without	graphite-bronze
Lead gear	2	10-inch	steel-snatch	swivel	without	graphite-bronze
Lead gear	1	8-inch	wood-snatch	swivel	without	graphite-bronze
Hoisting gear..	2	16-inch	steel-double	loose	with	metalline
Hoisting gear..	2	16-inch	steel-single	loose	with	metalline
Hoisting gear..	2	14-inch	steel-double	loose	with	metalline
Hoisting gear..	2	14-inch	steel-single	loose	with	metalline
Watch tackle..	2	8-inch	wood-double	swivel	with	graphite-bronze
Watch tackle..	2	6-inch	wood-double	swivel	with	graphite-bronze
Relieving tackle	4	8-inch	wood-double	swivel	with	graphite-bronze

WIRELESS HALYARDS

Wireless halyards, if of wire rope, are frequently made 3/8-inch diameter, even where a smaller rope would answer as far as strength is concerned. They are preferably galvanized cast steel 6 by 19 construction, with ultimate strength as given in Table V.

Manila ropes should be of ample size to take the load.

Blocks for wire rope can be of small size on account of the practically permanent nature of the installation.

WORMING

Worming is the process of winding small ropes or "fittings" along the grooves between the strands of a wire or fiber rope that is to be parcelled with canvas or other cloth thereby making a more even surface for the cloth covering. Tarrred marline or seizing is used for wire ropes, and marline, seizing, houseline, roundline or hambroline are used for fiber ropes. The size to use depends upon the size of the groove to be filled in.

MISCELLANEOUS

The following points are of interest in connection with a consideration of ropes:

Turnbuckles are preferably of the pipe variety where exposed to the weather so that the threads will be protected as much as possible from corrosion; although on sailing vessels where shrouds have to be disconnected so that cargo grabs will clear them, open turnbuckles are sometimes more easily handled.

Wire rope sockets have proved their worth as substitutes for thimbles and splices, and when properly applied will not pull loose even when the rope is pulled to destruction. The wires are spread apart in the form of a brush inside of the socket, which is then entirely filled with pure molten zinc. In order to guard against corrosion of the rope from water around it where it enters the socket, the rope should be wormed, parcelled and served for a length of about two feet, the parceling and serving extending on to the socket for about two-thirds of its length. The closed sockets are the most desirable for the rigging and similar work.

Lightning conductors might be considered under the head of wire ropes. They are of course of copper. A good size is the 1/2-inch rope composed of 34 No. 15 B.W.G. wires.

Air Gun Has Wide Range of Usefulness

JENKINS BROS., Bridgeport, Conn., manufacturers of air valves, have produced a new type air gun which has a wide application in foundries, machine shops, wood working mills and the like for cleaning chips, dust and foreign matter from work being fabricated and from molds and castings. A special feature of this gun is a renewable disk designed for air service which forms a perfect contact on the valve seat and takes up the wear of frequent usage. The gun can be used with 1/8-inch, 1/4-inch, 3/8-inch and 1/2-inch hose pipe by the use of different size nipples.

New System Removes Oil Sludge and Dangerous Gases

H. J. Wheeler Salvage Company Perfects Nozzle Which
With Aid of Vacuum Pump Emulsifies Oil Residue

By Gunnar C. Engstrand, M.E., B.A.*

A NEW system for removing and disposing of the oil sludge or residue that accumulates in the double bottoms and tanks of oil burning vessels has been evolved and put into operation in New York harbor by the H. J. Wheeler Salvage Company of Brooklyn, N. Y. As is well known, this residue which is a thick clinging mass of almost jelly-like consistency is very unpleasant and difficult to handle.

It is heavier than oil and settles on the bottoms of the tanks. Sometimes it is heavier than water in which case, if discharged overboard, it would sink harmless to the bottom but more often it is about of the same specific gravity of water and it remains suspended in the form of chunks, threads or flakes. It is in this condition that it is particularly dangerous, for when it is washed against a solid, like piles or bulkheads, it will tenaciously cling to their surfaces which in a short time receive a tar-like inflammable coating.

It is claimed that because this oily residue has about the same specific gravity as water a satisfactory separation by centrifugal means cannot be obtained and that the mixture removed by such means is not suitable or fit to be burned under boilers. In fact it must be disposed of as a dangerous waste, as obnoxious and inflammable gases generate from and cling to the sticky surface of the residue.

ARRANGEMENT AND METHOD OF OPERATION

The arrangement of the Wheeler system is shown in Fig. 1, where a section is taken through the salvaging barge and a vessel from which oil sludge is being removed. Starting

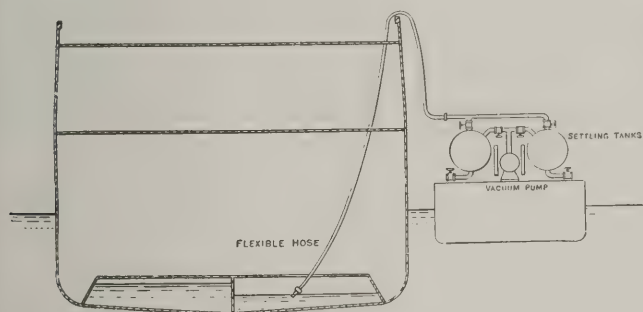


Fig. 1.—Section Through Salvaging Barge and Vessel from Which Sludge Is Being Removed

in the oil tank and attached to a flexible hose is a nozzle, the mechanical arrangement of which has not been made public. The nozzle is globular in shape, having air inlet holes spaced circumferentially around it. A tubular extension of several inches projects beneath it.

It will be noted that there are two tanks on the deck of the barge with an air pump placed between them and it will also be seen that these tanks discharge to the hold of the barge, to tanks ashore or to a tender alongside.

The system operates as follows: The intake of the nozzle is immersed in the sludge to be removed but not deep enough to submerge the air inlet holes in the globular body. Using a working vacuum of only 20 inches, air from the atmosphere is drawn through the inlets with a velocity of approximately

800 feet per second and in so doing mechanically cracks the oily residue until it is minutely subdivided and suspended in the moving air stream inside the hose. In other words, the sludge which is as heavy or heavier than water is emulsified and drawn up through the flexible hose and into one of the cylindrical tanks shown. When one of the cylindrical tanks is filled the suction is by-passed to the other tank, while the discharge from the full tank to the hold of the barge is opened and the emulsified oil blown into it. The contents of the tanks can also be discharged to receptacles on shore or to a tender alongside by means of compressed air.

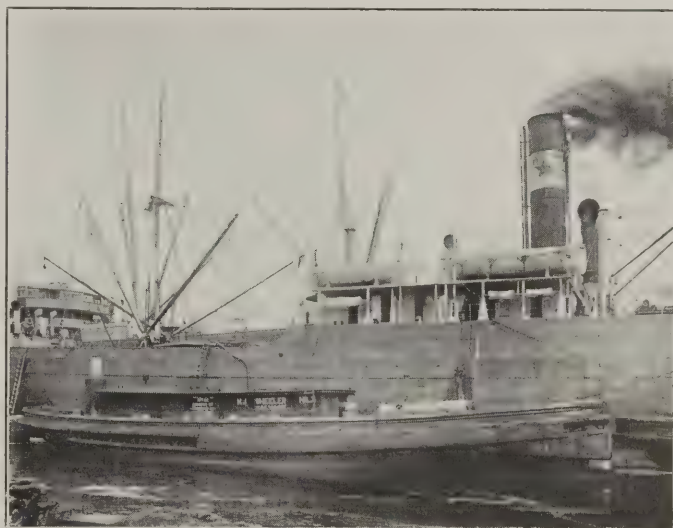


Fig. 2.—Wheeler Barge in Operation

After this emulsified product has settled in the hold of the barge the oil will flow to the surface leaving clear water underneath.

The bottom settling is clean water which is discharged overboard and the oil residue, which is now free of water, is suitable for burning under the boilers.

A very important claim for this system is that the obnoxious and dangerous gases that are generated in oil tanks are pumped out with the air and sludge. Chemists' tests have shown only a trace of .001 vapor in tanks after cleaning with the Wheeler apparatus.

Hundreds of well-performed tank cleaning jobs in the port of New York have amply proven the efficiency of this apparatus. Even "sour" oil which is an intimate and churned mixture of oil and water will separate. This separation takes about 12 hours, while the settling ordinarily is effected in 3 hours.

Fig. 2 shows one of the Wheeler barges in actual operation alongside of a ship. A striking example of the low specific gravity of the emulsified residue was shown on a recent job on the *American Legion*. One of the Wheeler barges named the *Gladiator* pumped 150 tons of oil residue from the forepeak of the *American Legion* in 44 hours against a head of 65 feet. The importance of the ability to carry a hose up over the high deck of a passenger ship and remove such a substance as oil sludge against a head of 65 feet does not need any comment.

*Chief engineer, Donnelly Dry Dock Company, Inc., New York.

Twin-Screw Oil Burning Turbine Liner *Albert Ballin*

New System of Anti-Rolling Tanks Installed—To Equal *Majestic* and *Leviathan* in Comfort and Conveniences

ACCORDING to cable advices received from the Hamburg-American Line in Hamburg, their new twin screw oil burning turbine steamship, *Albert Ballin*, was successfully launched in the yards of the Blohm and Voss Shipbuilding Company of Hamburg on December 16, 1922.

The *Albert Ballin*, named after the late Director General of the Hamburg-American Line, is the first one of two large steamers of modern type ordered by the company about two years ago for the service between Hamburg and New York

occur on account of shallow draft as in the case of the *Cap Polonio*.

ACCOMMODATIONS

Accommodations have been provided for 250 first class passengers. In the planning and equipment of the state-rooms and suites the greatest care has been exercised to make them equal in comfort and convenience to the gigantic *Imperator* and *Vaterland*, which were put in service by the Hamburg-American Line just before the war. There will be four large suites consisting of sitting room, bedroom and bath as well as wardrobe or trunk room, and a number of large staterooms with private bath. All of the other cabins will be of large size and comfortably arranged. There will be only a small number of inside rooms, and even these are so placed that they will receive light from the side ports. All rooms will be equipped with regular beds, wardrobe, dressing table, and most of them with running hot and cold water. Liberal space has been provided for the public rooms such as social hall, library, writing room, smoking room with gallery and veranda café, gymnasium and electric bath.

The main promenade deck, partially enclosed with "Laycock" windows, as well as the boat deck, will provide ample space for deck chairs and promenading.

The second cabin, accommodating 340 passengers in large well-ventilated 2- and 4-berth rooms, will have very commodious and well-appointed public rooms, *i. e.*, social hall, smoking room and large dining room, the latter with a capacity for 300 persons at one sitting. Also in the second cabin the stateroom arrangement has been so planned that there will be only a few inside rooms. There will also be ample space for deck games and promenading.

Passenger elevators are provided for second cabin, as well as first. Particular attention has been given to the location,

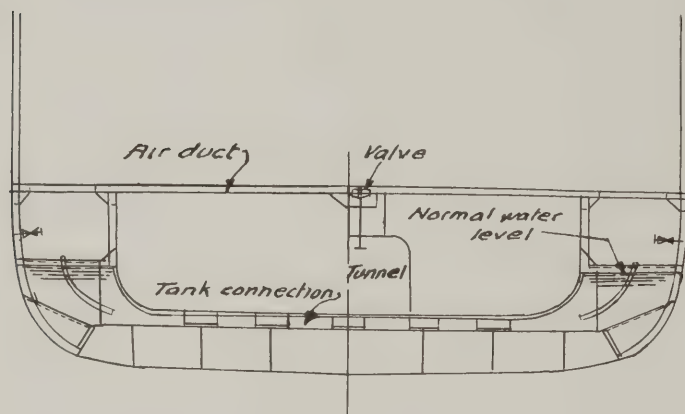


Fig. 1.—Old Type Anti-Rolling Tanks

via Southampton and Cherbourg. The sister ship *Deutschland* will be launched from the same yard in the course of 1923.

The vessel just launched is scheduled to enter the joint service maintained by the United American Lines and the Hamburg-American Line in May, 1923. The *Albert Ballin* is a vessel of 22,000 tons gross register. She is over 600 feet long overall, with a beam of 73 feet, and is provided with 7 decks for the accommodations of 250 first cabin passengers, 340 second cabin passengers and 1,100 third class passengers.

FRAHM ANTI-ROLLING TANKS

A special feature of this new ship will be a new anti-rolling tank system which is an invention of Dr. Frahm of the Blohm and Voss Shipbuilding Company. This is the first application to a steamship of the new system which is a combination of the built-in tanks ordinarily employed, see Fig. 1, and the hull bulge, see Fig. 2, which was originally tried out as an experiment in the construction of the steamship *Cap Polonio*.

The *Cap Polonio* was built especially for the South American service and required light draft in order to be able to navigate the comparatively shallow waters of the River Plate. In order to insure stability on this light draft, bulges were incorporated on each side of the hull along a considerable length and this experiment has proven quite satisfactory in stabilizing the ship. Dr. Frahm then conceived the idea of combining the anti-rolling tank and the bulges which has been successfully applied to submarines. In the case of the *Albert Ballin* and the *Deutschland* the bulge plan has been adopted in order to give stability above the ordinary rather than to overcome instability that might

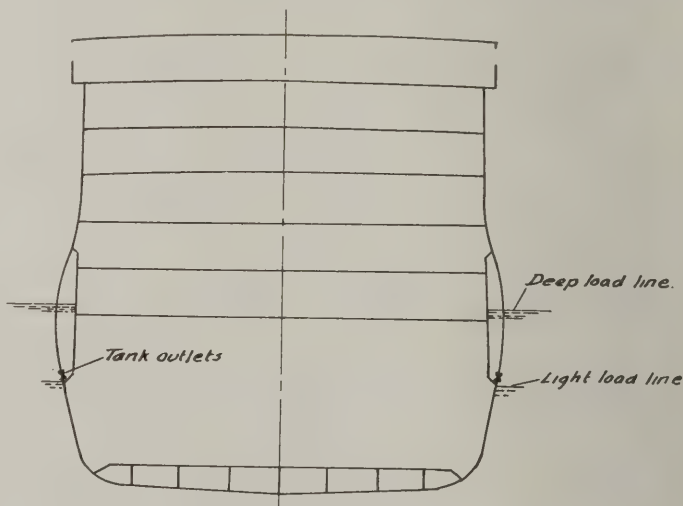


Fig. 2.—Showing Bulge Anti-Rolling Tanks

arrangement, and equipment of the kitchens, pantries, storerooms and refrigerator rooms for the large quantities of food supplies required, so as to furnish the best possible service and cuisine.

The third class, which is provided with a large and tastefully appointed social hall, smoking room and dining room, the latter with a capacity for 420 passengers, will have state-

room accommodations for 660 passengers in 2-, 4- and 6-berth rooms. Additional space for about 440 third class passengers in large and well-ventilated compartments for families can be arranged for, if necessary.

For the safety of the passengers and crew adequate life boats are provided, suspended from the latest approved type of davits. A powerful wireless station is located on the uppermost deck of the ship. The hull is divided into numerous watertight compartments which can be controlled from the captain's bridge. In addition there will be provided all modern safety devices, such as smoke detecting apparatus (Rich system) for fire prevention, submarine bell system,



Fig. 3.—Steamship Albert Ballin Recently Launched at Hamburg

telephone connections to all departments of the ship, gyroscopic compasses, automatic steering device, etc., etc.

The engine room is equipped with steam driven turbines with double reduction gears, which will develop 13,000 horsepower, giving the vessel an average speed across the Atlantic of 15½ knots. The 8 large Scotch boilers are fed with fuel oil and equipped with Howden's forced draft. The oil is carried in specially built oil bunkers, as well as in the double bottom, which are provided with every known safety device.

System for Handling Bunker Oil From Storage

A SYSTEM of fuel treatment which supplies a practical method of handling lower grades of fuel oil from storage is being manufactured by Row and Davis Engineers, Inc., New York, under the name of the RanD system. This system, it is claimed, reduces the cost of upkeep and costly delay in handling fuel oil by avoiding the use of steam heating coils in the inner bottom tanks. In the RanD system circulation is maintained in every part of the tank by means of a jet of heated oil forced into the mass of cold oil. This jet of hot oil comes from a discharge nozzle shown in Fig. 2, which is so constructed that it revolves slowly in a horizontal plane, thereby causing agitation in every direction throughout the tank.

The supply of hot oil comes from a central heater located in the boiler or engine room with connection to a circulating pump which, in ships already constructed, is generally the existing transfer pump.

If the vessel is not fitted with a supply or settling tank, a specially designed bulkhead connection is fitted with frames and covers to which is attached a heating coil with outside

joints and an auxiliary suction valve to the deep tank. This forms an auxiliary for temporary use after the vessel

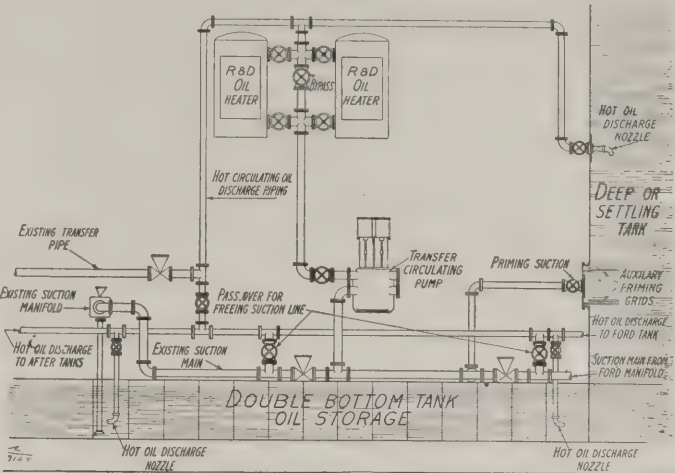


Fig. 1.—RanD System of Handling Lower Grades of Fuel Oil

has been lying at its dock and the entire mass of oil in the deep tank has become congealed. The discharge from the circulating pump is led to the central heater where the

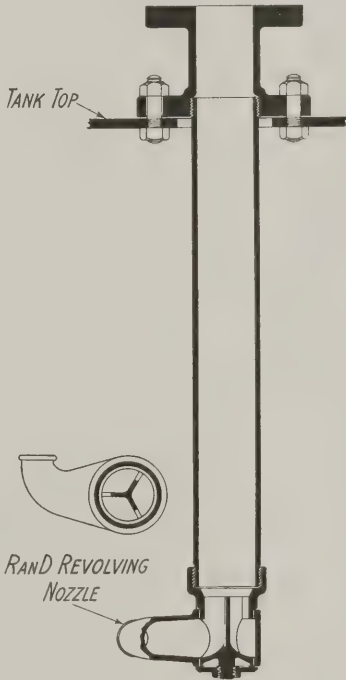


Fig. 2.—Revolving Discharge Nozzle

oil is heated by exhaust or live steam. It then goes to a main discharge pipe with distributing branches leading to the discharge nozzles of each tank compartment.

CONSOLIDATION OF WAR AND NAVY DEPARTMENTS PROPOSED.—Consolidation of the War and Navy departments into a Department of National Defense, designed to function under a Cabinet officer with assistants in charge of the army and navy, respectively, has been definitely recommended to President Harding by Walter F. Brown, head of the commission appointed to prepare a plan of government reorganization. The President has recently been giving a good deal of time to the consideration of the entire report and is expected to send a special message to Congress on it soon.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Stop Waters

Q. (1176).—What are stop waters and where are they used?

A. (1176).—Stop waters are strips of tarred hemp felt, flat lampwick or burlap, soaked in a mixture of red and white lead, or sometimes a stiff mixture of red and white lead putty. They are placed between joints where watertightness cannot be obtained by calking and also where non-watertight members pass through watertight members to prevent water passing from one side of the watertight member to the other.

See page 461 "The Naval Artificer's Manual," by Pate.

How to Remove Dent from Shell Plating

Q. (1177).—Please describe means or method of removing a dent from a vessel's plating.

A. (1177).—When the dent is not deep it is sometimes possible to remove it by hammers or jacks. If the dent is deep, a hole may be drilled in the center and a draw bolt introduced. This bolt extends through a heavy strong back placed on the concave side of the dent. As the bolt is drawn up, hammers should be used on the convex side. Under some circumstances the plate must be heated at the dent by means of a blow torch.

Outlook for Naval Architects

Q. (1181).—What do you think is the outlook in the marine engineers' and naval architects' profession for the near future? I have just graduated from a first class technical university. I feel that I cannot afford to lose much time and follow up a line which may continue to have poor prospects for new entrants for some time to come.

A. (1181).—The outlook in the marine field today, so far as that portion of it which touches and competes with foreigners is concerned, is very uncertain. We have not been a maritime nation and we do not yet really know what the attitude of the American public is toward our foreign going merchant marine.

I believe that we as a nation must ultimately, in self-defense, develop and support a foreign going merchant marine. It will probably be a matter of education and development. Such a course may be a matter of years, perhaps decades.

There is and has been for years business on the Great Lakes and along our coasts. This business has gradually built up large fleets of ships of special types.

I look for a great, possibly gradual, expansion in traffic on our inland waterways. There has been much experimental work along this line in the past ten years. This work is already showing results.

If a young man is thoroughly trained for and interested in marine work, I think he will be able to make a fair living at it, particularly if he connects himself with concerns which

deal largely in shipping for the Great Lakes, inland waterways or coast and gulf.

However, I have known a number of young men of good education and excellent ability who have left the marine field and made good in business or other branches of engineering. I believe that they have in most cases secured greater and more immediate returns than would have been theirs had they remained in the marine field.

Finest Form of Underbody

Q. (1183).—Kindly advise me as to the finest form of underbody which can be used. I am anxious to obtain a form of very low resistance and understand that destroyers are sometimes given block coefficients of 0.39 and 0.40.

A. (1183).—The block coefficient is not considered a good criterion for underbody form when speed is the governing consideration because it gives no satisfactory idea of the longitudinal distribution of displacement. It is important to have this latter information because at moderate speeds

$$V$$

(values of $\frac{V}{\sqrt{L}}$ less than 1.1 to 1.2) the forward portion of the hull does the greater part of the wave making while at high speeds (those above $\frac{V}{\sqrt{L}} = 1.1$ to 1.2) the whole body

takes part in wave making. Now a small longitudinal coefficient means a concentration of displacement amidships; that is, a large midship section and finer ends. A large longitudinal coefficient means displacement distributed toward the ends or a moderate midship section and relatively full ends. Hence, for vessels of moderate or slow speeds in which low resistance is a governing factor a low value of the longitudinal coefficient is desirable. In vessels of high speed a high value of the longitudinal coefficient is used.

You have given no idea of the type of vessel or the speed which you have in mind. The following figures taken from successful vessels may prove of value:

	No. 1	No. 2
Length	510 feet	289 feet
Beam	63 feet	26.1 feet
Draft	20.5 feet	8.3 feet
Displacement, tons	10,000	742
Block coefficient	0.53	0.415
Midship section coefficient	0.98	0.67
Longitudinal coefficient	0.54	0.62
Designed speed—knots	23	30
$\frac{V}{\sqrt{L}}$		
Values of speed-length ratio, $\frac{V}{\sqrt{L}}$	1.015	1.76

No. 1 is a fuller vessel than No. 2 when judged by the block coefficient, but as shown by the longitudinal or prismatic coefficient it is a finer ended vessel.

The speed-length ratio for No. 1 is much lower than that for No. 2. The values of the longitudinal coefficients are suited to these speed-length ratios.

The *Shipbuilding Cyclopaedia*, Basic Design Section, gives data for the selection of suitable values of longitudinal coefficient for varying values of the speed-length ratio.

NEW BOOKS

Notes and Calculations on Marine Propulsion and PracticeReviewed by **H. Bakewell-Taylor***

THE MARINE POWER PLANT. By Lawrence B. Chapman, Professor of Naval Architecture, Lehigh University. Size, $5\frac{3}{4}$ by $9\frac{1}{4}$ inches. Pages, 320. Illustrations, 113. Tables, 15. New York, 1922. McGraw-Hill Book Company, Inc. Power Plant Series.

This book represents in printed form a series of lectures given by Professor Chapman to the marine engineering students of Lehigh University. The chapters are well written and possess the great commendation of brevity without loss of substance and necessary facts.

The little volume, while being intended for the elementary classes in marine engineering, contains much information in a compact form to make it useful as a reference book to marine engineers, draftsmen and superintendent engineers, and it could be studied with much advantage by the sea-going engineers of our merchant marine desiring a fuller knowledge of certain facts and figures connected with their profession as well as by operators who wish a closer grasp of marine engine practice and progress. While not as large and detailed a work as the well known volumes of Seaton, Durand and Bauer, nor along the more specific lines of those by Dyson, Peabody, Barnaby and Bragg, the book is nevertheless a distinct addition to the all too scarce well arranged and up-to-date literature on marine engineering design, principles and practice.

The chapters are clearly written and well illustrated and the text, other than simple and necessary equations and formulæ, has been kept particularly free from involved mathematics, the author giving, however, some very useful curves and tables as well as a number of fully worked out examples in marine power plant design and also some general arrangement of machinery drawings.

The book includes chapters on Thermodynamics of Steam, Fuels, Marine Boilers, Combustion, Draft, Superheaters, Reciprocating Engines, Turbines and Gears, Combination Machinery, Steam and Diesel Electric Drives, Diesel Engines, Condensers, Air Pumps and Feed Heaters, Power Plant Layouts, Computations for the Power Plant of the Merchant Ship, together with a chapter on Comparison of Coal and Fuel Oil for Steamships. The author has confined himself to stating the broad principles of each subject dealt with in the various chapters of the work, and has conservatively analyzed and presented the conclusions drawn therefrom. While ship-resistance, propellers and detailed engine design are only briefly touched upon, readers are referred to authoritative works on these and kindred subjects.

The tables and data given cover Machinery Weights per Horsepower, Steam and Fuel Consumption per Horsepower, Steam Consumption of Marine Auxiliaries, Reduction Gears, Condenser Performance, Comparison of Machinery Installations, Diesel Engine Trials, Diesel and Electric Drive Ship Particulars, Performance of Steam Reciprocating Engines, Particulars of Fuels, etc., etc. The worked out calculations and examples for proposed designs of propelling machinery are clearly presented, and the general data in the text are for the most part up to date and reliable in so far as they could be referred to in the limited time given to a preliminary study of the volume.

*Chief Turbine Engineer and Chief Inspector for United States Shipping Board, New York.

We would suggest that in a future edition the chapters be a little more logically arranged in engineering sequence, and that certain illustrations be placed with the text of the chapters they are to illustrate, particularly those of the Howden Forced Draft System shown on pages 84 and 85; also certain similar figures should be numbered "a" and "b" so as to conform to the practice followed elsewhere in the volume, and Fig. 60, showing the General Electric Company's type of Geared Turbine, which has evidently been accidentally omitted, should be included.

In conclusion, the author is to be complimented on turning out a handy, lucid and excellent little volume which should add to the series it is written for and be on the bookshelves of marine engineers, naval architects and operators, in addition to providing the students for whom the lectures were prepared a permanent printed record of them.

LETTERS TO THE EDITOR

A Proposed Remedy for Vibrations Caused by the Propeller

A POINT that is frequently overlooked in propeller design is the tendency of the wheel to produce vibrations. To be sure, these are often caused by disturbances which are outside of the province of the designer, such as unequal pitch, which may be due to warping of the blades or poor workmanship when the blades for a built-up propeller are assembled. These, however, are probably of a small magnitude in comparison with the one con-

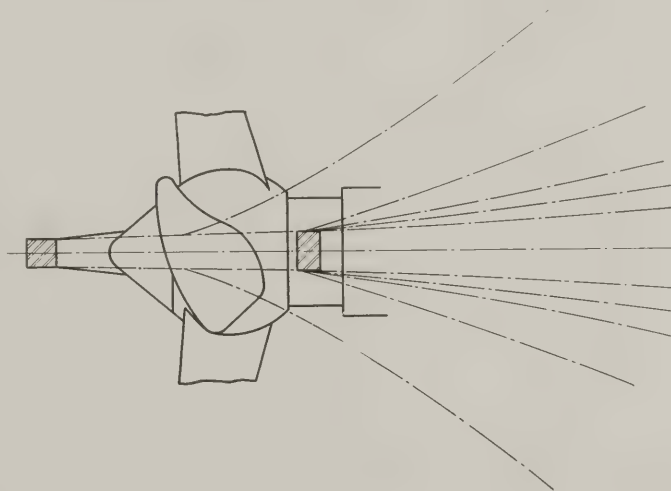


Fig. 1

trolled by the designer, namely the distribution of the blade area.

Fig. 1 shows roughly the waterlines of a single screw ship with a propeller of the conventional right handed type. In order to explain the action of this propeller in a simple way we shall refer to a propeller pump with guide vanes. When these guide vanes are pointed in the direction of rotation a minimum discharge is obtained, whereas if the guide vanes are pointed in the opposite direction, or against the rotation, it is a well known fact that the discharge will be a maximum.

Referring to Fig. 1, it is shown that the ship's lines resemble very closely the guide vanes of a propeller pump, at least to an extent sufficient to invite a discussion. If we study a blade as it approaches the top, we find that at first, when it is horizontal, feed is normal, then as the blade moves

closer to the top a reduced feed is experienced because the lines of the ship follow the direction of rotation. The feed reaches a minimum when the blade is about to pass the sternpost, and it is therefore obvious that, as less work is performed, the torque will also reach a minimum. In ships that have a heavy deadwood and have the propeller working in close proximity to this, very severe vibrations are encountered; the dangers of this kind of construction are, however, generally realized.

It might be argued that in a ship with a very fine run this tendency for vibration should be obviated, but it must be remembered that in this case the whole stern structure will respond more readily to any disturbance.

When the leading edge of the blade has passed the sternpost, the ship's lines are inclined against the direction of rotation and the feed, and consequently the torque, will, therefore, tend towards a maximum. Where the angle of the run is large this change will naturally cause an increase in the fluctuations. As the blade moves on, the stream lines following the sides of the ship and the wake acting on the back side of the blade cause the torque to reach a maximum. This cycle will of course be repeated as many times per revolution as there are number of blades per propeller and thereby produce vibrations. The same discussion also applies to the lower side, although in most cases to a less degree.

The obvious remedy for this trouble would of course be to have the propeller removed as far as possible from any influence of the ship, an attempt to which is found in the rake of the blades. This, however, is not sufficient and we must

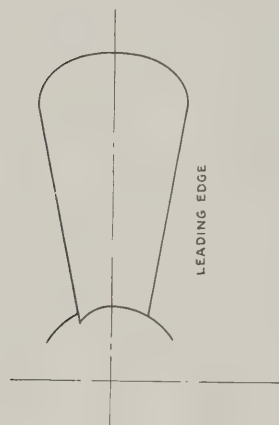


Fig. 2

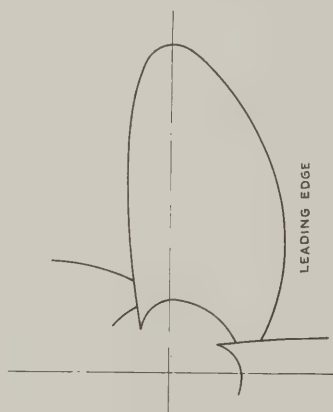


Fig. 3

therefore look for another remedy. Figs. 2 and 3 show two blades with extremely different outlines. The leading edge of Fig. 2 is straight in a radial direction, whereas Fig. 3 has a gradually curved leading edge. If we now apply the above discussion to these blades, we find that the entire length of the leading edge shown in Fig. 2 will enter the region of maximum feed very suddenly and the change from minimum to maximum torque will therefore be almost instantaneous. The curved edge of the other blade, Fig. 3, will on the other hand change from minimum to maximum conditions very gradually and the fluctuations will be very diminished. If special attention were paid to this feature when designing a new propeller, it would be almost possible to build a propeller having no vibrations. This kind of blade would also perform much better when the propeller is only partly submerged.

It must of course be admitted that a blade of this type, having the maximum blade area near the hub, is not quite as efficient as a blade of standard shape but all engineering is of necessity a compromise to arrive at the best average results.

Fig. 3 is an approximate outline of the type of propeller which replaced the original wheels on a well known quad-

ruple screw turbine steamer. It is probable that vibrations were partly responsible for this change, because any reduction in propeller efficiency caused by the overlapping blades would probably not be tolerated in an installation of this size unless it were absolutely necessary. The stress at the root of the blade could not have been the only cause, because the added metal which increases the blade area at this point has practically no influence on strength.

From a purely economic point of view, it should undoubtedly prove beneficial to pay close attention to this subject of distribution of blade area and shape of the leading edge, inasmuch as it results in a smoother working of the entire installation and thereby reduces the maintenance cost.

Kingfield, Me.

HAROLD ANDERSON.

Why the Poughkeepsie Did Not Make Her Speed

The *Poughkeepsie*, which was recently placed in operation on the Hudson river between Poughkeepsie and Highland, N. Y., is the first ferryboat to be constructed on the "Hullfin" principle. She is 140 feet in overall length, 52 feet in extreme beam and has a loaded draft of 9 feet 6 inches.

The main part of the hull is broad and shallow, having no overhanging ends or guards. It is built of steel and designed with the extra strength necessary to permit its use as an ice breaker in unusually heavy ice. On the bottom of the hull a fin is constructed that is six feet wide and six feet deep amidships. This fin is made just wide enough to allow for the installation and care of the electric propulsion motors and tapers in width to the stem and stern posts which are placed about 20 feet back from the ends of the hull.

The propelling machinery consists of two six-cylinder Diesel engines of 150 horsepower each, which are directly connected to two 90 kilowatt generators which in turn were supposed to actuate two electric motors of 100 horsepower each at 600 revolutions per minute. This ferryboat was intended to make 10 miles per hour with this minimum power plant and would have done so, but right after a permit to use the "Hullfin" patents had been obtained the inventor was not allowed to co-operate in the construction of the vessel and many parts of the hull were built in direct opposition to his advice.

The following are my reasons why the ferryboat did not make her intended speed: First, the fin was built two feet deeper than was necessary or intended, creating quite an unnecessary drag.

Second, although a 3½-inch propeller shaft was considered ample by the machinery people for the size of the wheels and the power applied, a 5-inch shaft was used, wasting much power.

Third, the stern posts of the fin and the fore-and-aft edges of the rudders were unnecessarily thick, which greatly disturbed the water in the vicinity of the high-speed propellers.

Fourth, the propellers were found to be much larger than the motors could turn. The design called for 600 revolutions per minute, but only 350 could be obtained, which gave returns equivalent to half speed and power. The only way to obtain the full efficiency from the power in this craft is to design the propellers with a smaller diameter and less pitch, and with edges properly shaped for the high revolutions.

Fifth, the bow of the fin is located well aft of the bow of the main part of the hull where the bottom is wide. The forward wheel drives the water faster as it spreads along the wedge shaped side of the fin and when this water arrives at

the widest part of the fin it is going at such a high rate of speed that it is unable to change its course quickly enough to follow the lines of the fin. Thus there is a void formed which holds on to the boat until the suction is relieved by water, as there is no opportunity for air to get there. By experimenting this suction was discovered and by the same means a remedy was found which is known as the air release. This is a means of allowing air to be drawn through holes in the skin of the vessel in the proper places to relieve the suction.

In closing, I will state that it is only necessary to reduce the size of the propellers properly, and to apply the air-release, to get fair results from the power applied. Much better results might have been obtained if all material parts had been produced with the proper degree of fineness to obtain the best results from the small amount of power.

New York.

SAMUEL GOLDEN, President,
Hullfin Boat Company.

Why More Power Can Be Obtained by Solid Injection

With the solid injection system that we use, very high net mean effective pressures, figured from the brake horsepower, are obtained. With the ordinary air injection system it is very difficult to get over 80 pounds mean *net* pressure per square inch, while with the solid injection we are able to get very high mean net effectives, in some cases running as high as 135 pounds, and even slightly higher. We rate our engines at 100 pounds, at which mean net effective pressure there is perfect combustion, the height of thermal efficiency and therefore a clear exhaust.

There are three principal reasons why higher mean net effective pressures can be obtained with a solid injection. The first is the elimination of the power necessary to drive the high pressure air compressor supplying air for injection purposes. In engines of small size, it takes an average of 10 percent of the main power to drive this compressor, which is entirely saved with the solid injection. In addition to this the high pressure air expanding in the combustion chamber from 1,000 pounds to approximately 500 pounds absorbs a great deal of heat from the compressed air in the combustion chamber. This heat has been obtained at the expense of power in compressing the air in the combustion chamber. This loss of heat decreases the pressure in the combustion chamber, resulting in the loss of just that much power, which we find, by experiment and careful analysis, to be about 8 percent. It is true that the indicator card, with the air injection system, does not show any drop of pressure at the top of the working stroke; on the contrary, there is a slight raise in pressure, which is approximately five pounds, this pressure being maintained for a slight distance across the card as the piston is on the downward stroke. This loss makes a total of 18 percent, which is saved by the use of solid injection, and therefore adds that much to the mean net pressures.

In contrast with this operation of the high pressure air injection, we have the solid injection engine injecting the fuel into the combustion chamber without the thermal loss from the high pressure air, as explained above. No heat is lost from the compressed charge of air, consequently a lower compression (about 350 pounds) is equally effective in igniting the fuel. As the fuel enters through the nozzle into the combustion chamber, there is a sharp rise in pressure, which takes place at the top dead center on the working stroke and amounts to from 200 to 250 pounds. The fuel continues to enter over approximately the same length of stroke as the air injection engines (about 30 degrees), and this higher pressure, which we call the maximum work-

ing pressure, totaling approximately 550 pounds, is held over quite a period on the downward working stroke of the piston, thus greatly increasing the area of the indicator card, resulting in a much higher mean net effective pressure.

It is true that the mean indicated pressures of the air injection engines are nearly as high as those on the solid injection. No doubt they would be the same, if it were not for the thermal losses from the expanding high pressure air, because the mechanical losses are about the same in each type, except that which is accounted for in the high pressure air compressor.

The extremely high mean effective pressures which can be obtained from solid injection are due, so far as we are able to ascertain, from what the refining companies call the cracking process. Our theory of this matter is very well borne out by an analysis of the exhaust gases and from a knowledge of the characteristics of oil under similar conditions. We explain it in the following manner:

Oil is made up of little cells, which we may consider for the moment as being circular and similar to a grape, with an outside skin composed of the lower carbons, while the interior contains the higher volatile hydrogens, and also probably contains a slight pocket of gas of some form. When oil is put under a high pressure (1,000—4,000), as it is for solid injection, it compresses slightly. It is very probable that this compression is allowed by the small gas pocket contained within the cells of the oil. When these cells escape quickly from their high pressure in the nozzle they expand quickly to their natural shape and, assisted by the heat in the combustion chamber, they burst, thus releasing the hydrogen, or, as some term it, freeing the carbon. The hydrogen burns, or rather unites more readily with the oxygen than does the carbon, and generates a good deal more heat per each unit of H_2O than per unit of CO and CO_2 . By releasing an excessive amount of oil in a combustion chamber it appears that the hydrogen burns first to a large extent, thus greatly increasing the heat and power, as long as there is oxygen left for it to unite with, and leaving the carbon in the form of gas still unburned and which is driven out through the exhaust on the scavenging stroke. This, of course, is not good economy, and consequently we rate our engines at a low enough mean effective pressure, to give the height of thermal efficiency and fuel economy. This is about 100 pounds per square inch.

The rise in pressure at the top of a working stroke, by the use of solid injection is sometimes called detonation and can be well considered as such except that it is not the kind of detonation experienced in a gas engine, where it is more or less objectionable, owing to the inability of controlling the point of pre-ignition, which causes the detonation in the gas engine. With a Diesel engine the point of ignition is absolutely controlled by the timing of the valve, thus getting power from these detonations, and still having a soft, smooth running engine, very similar to a steam engine which always has a certain amount of lead, as well as lap, to cushion the impulse over the center.

Oakland, Cal.

O. A. TREIBER,
Atlas Imperial Engine Company.

THE AMERICAN ENGINEERING STANDARDS COMMITTEE has approved as "Tentative American Standard" the methods for the chemical analysis of alloys of lead, tin, antimony and copper—otherwise known as babbitt metal—submitted by the American Society for Testing Materials. Two methods of analysis are included in the document approved by the A.E.S.C. The first is a quick and fairly accurate method intended for practical or shop use; the second is a slower, more elaborate and more expensive, and more exact method intended for reference purposes or for the settlement of disputed questions.

PERSONAL MENTION

G. F. S. MANN has become connected with the estimating department of the Charles Ward Engineering Works, Charleston, W. Va.

A. J. PASCH has been appointed head of the South American and West Indian trades for the Shipping Board, effective January 15, vice S. W. Pierce, resigned.

JOSEPH T. MARTIN is now engaged in business at Baltimore, Md., as a consulting engineer and marine surveyor with offices at 409 Exchange Place.

FREDERICK FRANZ, who for the past four years has been chief engineer of the Terminal Engineering Company, manufacturers of industrial trucks for marine terminals and the like, has established an engineering office at 27 Warren street, New York City.

MICHAEL D. SCHAEFER, who has been the civilian aid to the chief constructor, U. S. Navy, for many years, has resigned from the service to engage in private business with Commander J. W. Barnett, Jr. Mr. Schaefer probably knows personally more people in the marine field than any one else connected with the industry and his genial personality certainly entitles him to the best wishes of all his friends in the new venture. It is understood that Messrs. Schaefer and Barnett will specialize on Diesel engines, motorships and submarines and that they will also act as agents in Washington, D. C., for the Marine Decking and Supply Company and the Huhn Manufacturing Company.



Michael D. Schaefer

G. T. BRADLEY, formerly traffic manager for the United States Shipping Board at Baltimore, has been transferred to New York as assistant head of the European and Mediterranean Trades Division. Donald F. Washburn succeeds Mr. Bradley as traffic manager at Baltimore.

FRANK E. BOYD, formerly of the marine department of the Westinghouse Electric and Manufacturing Company, has been appointed general sales manager of the Harrisburg Foundry and Machine Works, builders of the dual clearance "Unaflow" and piston valve engine.

F. P. GUTHRIE, head of the Radio Division Operating Department of the Emergency Fleet Corporation, has been designated by Chairman Lasker as the representative of the Shipping Board and Emergency Fleet Corporation to serve as a member of the inter-departmental committee on electrical communications.

N. A. SMYTH has been elected president of the United States P. and I. Agency, Inc., a new organization with headquarters at 25 Broadway, New York, which has recently been set up by the United States Shipping Board to take over the protection for its ships now handled by the Steamship Owners' Association.

A. F. MACK, North Atlantic district manager of the Emergency Fleet Corporation of the United States Shipping

Board, has tendered his resignation on account of pressing business interests. He will be succeeded in this office by W. J. Love, vice-president and general manager of the Emergency Fleet Corporation.

S. W. PIERCE, who since the war has been actively associated with the United States Shipping Board and for more than two years was the head of its South American and West Indies freight department, has resigned to become vice president of W. E. Hodges and Company, 25 Beaver street, New York, steamship agents and freight brokers.

DEAN J. HANSCOM, formerly foreign passenger agent of the Admiral Oriental Line, Seattle, Wash., has been appointed general agent of the company. Mr. Hanscom was one of the pioneers for the company when it opened its offices in the Orient in 1918, where he spent three years. He later returned to Seattle where he became foreign passenger agent.

L. L. BATES, foreign freight agent of the Admiral Oriental Line, Seattle, Wash., has been appointed general freight agent of the Line. Mr. Bates began his service with the company as a dock hand. Following his appointment as foreign freight agent he made a trip to the Orient to study conditions which was soon followed by his present promotion as general freight agent.

H. B. TAYLOR, who has been well known about New York as chief turbine engineer for the United States Shipping Board, has resigned to accept an appointment as marine superintendent with the Pacific Mail Steamship Company of San Francisco, California. He will have charge of the 535-foot passenger ships which this company is operating. Mr. Taylor's first engineering experience was obtained as an employee of the Parsons Steam Turbine Company in Great Britain. He subsequently became associated with the marine industry on the west coast of America, some thirteen or fourteen years ago, and held various executive positions in the shipbuilding and repair plants in Seattle and British Columbia. About three and a half years ago he accepted an appointment with the Shipping Board. He first joined the board in Philadelphia and was assigned to duty as an engineering inspector. After about one year he was transferred to the repair department at New York as chief turbine engineer and later assumed the duties of chief inspector as well, which positions he held up to the time of his resignation on December 15, 1922.

GEORGE W. WALKER has been appointed chief turbine engineer for the New York office of the United States Shipping Board, to succeed H. B. Taylor, resigned. Mr. Walker's appointment was received with great satisfaction by his associates, who have found him a well-balanced executive as well as an able engineer. He received his early training abroad and took to the sea while a young man. After following the sea for a number of years and obtaining his license as a marine engineer, Mr. Walker became interested in power plant work and was subsequently engaged in this branch of engineering in Chicago for a period of ten years. He maintained a lively interest in marine engineering, however, and still holds his license as marine engineer.

Mr. Walker first became identified with the Shipping Board about four and a half years ago, when he was appointed resident inspector at the plant of the Westinghouse Electric Company at East Pittsburgh, Pa. After serving as resident inspector at the Westinghouse plant for about two years, he was transferred to the New York office to assume the duties of assistant chief turbine engineer. These duties he has carried out for two years and a half, with credit to himself and the Shipping Board, his efficiency in handling the tasks assigned him resulting in the promotion just received.

Shipbuilding, Reconditioning and Operation

Port Expansion, Passenger and Freight Activities and Other
Notes of Interest in All Branches of the Marine Industry

Over \$318,000,000 Worth of Marine Work In 1921-22—Now for the New Year

IT is apparent that 1922 closed with business in much better condition than even the most optimistic had dared hope. Statistics compiled by MARINE ENGINEERING AND SHIPPING AGE show that there was reported in its columns in 1922 a total of more than \$84,981,517 worth of vessel construction and reconditioning work, when it was in contemplation, and over \$50,242,824 in contracts placed for similar work. In addition to this, there was also carried information on approximately \$88,106,661 worth of port work in contemplation with contracts awarded for such enterprises amounting to over \$11,286,004. For the year 1921, information was reported on all classes of marine work having a value of more than \$83,000,000, the total for the two-year period covering vessel construction, reconditioning, port and pier development, equipment, etc., well in excess of \$318,605,006.

To say that 1923 will start auspiciously is no exaggeration as inquiries by MARINE ENGINEERING AND SHIPPING AGE as to the prospects for the new year show encouraging results. It is expected that the first six months of 1923 will be featured by the placing of contracts for at least four new combination passenger and freight ships, reported during 1922 as in contemplation, and having a total estimated valuation of \$6,000,000. In addition to this new construction work, which at the present time seems practically assured if present plans are carried out, \$6,500,000 worth of ship reconditioning work involving the steamships *Agamemnon*, *Mount Vernon*, *President Grant* and *America* will also be in the hands of American shipyards during the early part of 1923.

Next Marine Show

Nov. 5-10, Architects

Meet Nov. 8 and 9

THE third annual exposition of the American Marine Association will be held in the Grand Central Palace, New York City, during the week of November 5-10, 1923, according to latest official announcement. In conjunction with the exposition, the Society of Naval Architects and Marine Engineers will hold its 31st annual convention November 8-9, the society's annual banquet being held on the evening of November 9 at the Waldorf-Astoria Hotel.

Reconditioning Bids

Rejected; New Boats

Planned Instead

IT is learned through the firm of Chapman & Fisher Company, Inc., consulting engineers and naval architects, Philadelphia, Pa., that the bids recently taken for the rebuilding of the passenger steamer *New Jersey* for the account of the Burlington Island Amusement Company have been set aside. The lowest figure submitted was \$119,500.

It is understood that instead of rebuilding the *New Jersey* the owners have decided to build new vessels. Plans for these proposed boats are expected to be complete during the first part of the year.

The Chapman & Fisher Company have also taken over a proposition to engineer and construct a water terminal along the Atlantic Seaboard.

Plans and Specifications in Course of Preparation for Overhauling Four Ships

The *Agamemnon*, *Mount Vernon*, *President Grant* and *America*
to be Put Into Service—America Out First With Specifi-
cations to Bidders in From Four to Six Weeks

SIX and one-half million dollars worth of ship reconditioning work on the biggest American merchant ships will be placed during the early part of 1923, according to data obtained by MARINE ENGINEERING AND SHIPPING AGE. Marked official activity has been evidenced with regard to the steamships *Agamemnon*, *Mount Vernon*, *President Grant* and *America*. Naval architects and draftsmen are already at work on the preparation of plans and specifications for the *America* contract and the *President Grant*, *Agamemnon* and *Mount Vernon* will follow in their turn.

AGAMEMNON-MT. VERNON

It is learned that on November 10, Shipping Board Commissioner Lissner, Vice-Presidents Love and Sheedy, Captain Bookwalter (in charge of the laid-up fleet), George Nichols (Assistant to Vice-President Sheedy), William F. Gibbs (naval architect in charge of reconditioning the *Leviathan*); C. A. Peterson and W. L. Bunker, representing the United States Lines, made an inspection of the *Agamemnon* at Hoboken, N. J. The *Mount Vernon* is at Boston and it is understood that Shipping Board officials have reported favorably to Chairman Lasker on the subject of reconditioning these two ships. It is estimated that the cost of the work proposed to be

done on the *Agamemnon* and *Mount Vernon* will reach a total of close to \$5,000,000 or two and one-half million, each.

Following the inspection of the *Agamemnon* by the officials mentioned above it was announced that the Board would appoint a Survey Board to make a complete inspection, or what is known as a scientific survey, of the two ships. So far as known at this time the personnel of this board has not been decided.

THE "BIG FOUR"

It is learned that according to present plans the *Leviathan*, undergoing reconditioning by the Newport News shipyard, at a contract price of \$8,200,000, will be taken
(Continued on page 56)

\$6,500,000 Repairs

(Continued from page 55)

over by the United States Lines. This great ship, it is stated, is to be run jointly with the *George Washington*, the *President Harding* and the *President Roosevelt*. These vessels, forming the main portion of the United States Lines fleet and operating in conjunction with each other, will form an enviable "Big Four," ranking as leaders of the world's transatlantic passenger carriers.

RECONDITIONING AUTHORIZED

According to reliable advices obtained by MARINE ENGINEERING AND SHIPPING AGE, the Shipping Board has authorized the reconditioning of the steamships *America* and *President Grant* as cabin and third class passenger ships. The *America*, the second largest ship in operation under the American flag, is now in the service of the United States Lines as a first, second and third class carrier. After a few more trips she will be withdrawn from the route for cabin conversion. This work will include the alterations and installations necessary for the accommodation of about 800 cabin and 1,200 third class passengers in rooms. The ship will re-enter the United States Lines' service for the early summer season.

The *America* has an overall length of 687 feet, beam 74 feet 3 inches, depth 52 feet 5 inches and speed about 17 knots. It is expected that after her conversion she will be the largest cabin carrier in the world.

Latest reports indicate that the *America's* reconditioning will be carried out under the direction of Captain R. D. Gatewood, Manager of the Maintenance and Repair Department of the Shipping Board. Preparation of plans and specifications will be done under the supervision of C. A. Petersen, naval architect for the United States Lines, and A. D. Woods, naval architect for the Shipping Board, Maintenance and Repair Department.

The specifications will cover the reconditioning of the hull and machinery; the rearrangement of present and installation of additional public rooms; overhauling the present and, wherever necessary, the installation of new systems such as ventilating, heating, electric, sanitary, etc. Specifications will probably be available to bidders in from four to six weeks.

THE PRESIDENT GRANT

In the case of the *President Grant*, the ship is to be reconditioned as a cabin and third class carrier, also for the United States Lines, to be run in conjunction with the *America*. Although no details were available at present as to who will prepare the plans and specifications for this contract, it is learned that the work has been authorized. It will include, among other things, the installation of new decks, the alteration of present and installation of new cabin accommodations, lifeboats, davits, re-equipment and refurnishing of new passenger accommodations, overhauling of engine and boiler rooms, main and auxiliary machinery, the ship's electric, ventilation, pump, sanitary systems, etc.

Wilmington Iron Works Low Bidder For Steel Barge

THE Wilmington Iron Works has low bidder for the construction of one 60-foot by 22-foot by 4-foot steel barge, at the opening of tenders at United States Engineer Office, Wilmington, N. C., December 26.

Plans and Specifications Out For Construction of Two Eastern Ships To Cost About \$3,500,000

First Big Job of New Year Provides For Highly Modern Passenger Steamers For New York-Boston Night Run—Will Be 402 Feet Overall Length, Turbine Driven, Oil Burning, For Express Service.

PLANS and specifications have been issued for the construction of two passenger steamers for the Eastern Steamship Lines, Inc., of which Calvin Austin, India Wharf, Boston, Mass., is president, bids to be received until about January 10, at the office of the designer of the vessels, Theodore E. Ferris, naval architect and marine engineer, of 30 Church street, New York City. It is believed the two ships will cost a total of close to \$3,500,000. A period of fourteen months is allowed for the delivery of the first vessel and fifteen months for the second.

Each steamer will have a length overall of 402 feet, length on 15-foot waterline 396 feet 4 inches, length between perpendiculars 385 feet, beam over guards 72 feet 6 inches, beam at 16-foot 6-inch waterline 56 feet 6 inches, depth molded to main deck at side 23 feet 9 inches, load draft 16 feet 6 inches. The steamers will be turbine driven and oil burning and will be put into service as night boats between New York and Boston, operating through the Cape Cod Canal, having a nominal speed of 17 knots with a possible maximum speed of 19 knots. The displacement on a 16-foot 6-inch draft will be 5,300 tons.

It is intended that the steamers will carry but one grade of passengers in rooms and in separate open spaces for berth travel of men and women. The total number of regular passenger rooms (two persons each) will be 267; de luxe rooms with adjoining baths (two persons each) 14; special rooms with adjoining toilets (two persons each) 64; or a total of 345 rooms accommodating a total of 690 passengers; while the berth travel is to accommodate 160 men and 50 women, making accommodations sufficient for the care of a total of 900 passengers.

The vessels will be twin screw, steel, sponson-sided type with freight space on the main deck and one freight hold, constructed with transverse framing, having complete double bottom and will be modernly equipped in every respect. The steamers will be equipped with lifeboats under davits with collapsible boats stowed under. This equipment is to consist of four metallic lifeboats, 24 feet by 7 feet by 3 feet, for 30 persons each; twelve

metallic lifeboats, 26 feet by 7 feet 9 inches by 3 feet 4½ inches, for 40 persons each; and twelve collapsible lifeboats, 24 feet by 7 feet by 2 feet, for 40 persons each. It is understood that the steamships are not to be built under the inspection of any classification society but all materials must fulfill mill tests required by the rules of the American Bureau of Shipping.

PROPELLING MACHINERY

The propelling machinery will consist of two latest design Parsons' single reduction gear steam turbines and six cylindrical return tube Scotch boilers, 16 feet 4 inches inside diameter by 11 feet 8 inches long over top heads, built for a working pressure of 200 pounds per square inch, and one donkey boiler, vertical, wet uptake type, 6 feet inside diameter by about 101 inches high for use during the winter layup period of the steamers, built for 150 pounds per square inch working pressure.

The twin screw turbine propelling machinery will be built from designs furnished by the Parsons' Steam Turbine Company, Ltd., of Wallsend-on-Tyne, England, and each set will consist of one high pressure and one low pressure ahead turbines in series, each driving a separate pinion through single reduction gearing. Astern turbines of the impulse type will be incorporated in each low pressure ahead turbine. The revolutions of the turbines at full power ahead will be as follows: high pressure turbines, 1,920 revolutions per minute and the low pressure turbine, 1,920 revolutions per minute and at these revolutions, developing a total of not less than 6,400 shaft horsepower. The speed of the propellers under these conditions will be 120 revolutions per minute.

BOILERS

The six boilers will be arranged for two firerooms, with grates fore and aft, and will be fitted with the Howden system of heated forced draft. The total effective heating surface of the boilers will be about 21,000 square feet. The furnace fronts of each boiler are to be arranged for burning oil fuel on the White system, as manufactured by the Todd Shipyards Corporation.

Construction of New Mississippi Steamer Proposed

CAPTAIN GORDON GREENE, of Cincinnati, O., is contemplating the building of a new stern wheel, all steel, river steamer, according to information obtained by MARINE ENGINEERING AND SHIPPING AGE. The boat will be of the Mississippi River type, about 170 feet long, and is to take the place of the steamer *Tacoma*, recently destroyed in a disastrous riverfront fire at Cincinnati. Captain Greene proposes to use as much of the machinery of the burned steamer as is possible in the new boat and will probably build new boilers.

Bids Open Jan. 27 at Florence, Ala., For Four Barges

UNITED States Engineer Office, of Florence, Ala., will receive sealed proposals until 11 A. M., January 27, for the construction and delivery of four steel barges to be delivered at Paducah, Kentucky.

The boats will have a length molded of 120 feet, beam molded 36 feet, depth molded 7 feet 6 inches. Each barge will be equipped with deck fittings including four 36-inch cleats, four 7-inch double bitts and four 30-inch open chocks, all of cast steel and of approved design.

Secretary Hoover Assures Standardization Committee Hearty Support at First Meeting

THE first meeting of the general committee appointed by Col. E. A. Simmons, chairman of the informal conference on elimination of waste in ship construction and operation through standardization held at the Grand Central Palace, New York City, on November 10 last under the auspices of the American Marine Association, convened at the Department of Commerce, Washington, on December 20. There were present Charles F. Bailey, Engineering Director of the Newport News Shipbuilding & Dry Dock Company, representing the shipbuilders for machinery; Hugo P. Frear, Naval Architect of the Bethlehem Shipbuilding Corporation, representing shipbuilders for hull construction and hull fittings; Commander R. D. Gatewood, representing the U. S. Shipping Board; W. F. Gibbs, representing the American Steamship Owners' Association; Capt. C. A. McAllister, representing the American Bureau of Shipping; Capt. John F. Milliken, representing masters, mates and labor organizations; E. H. Rigg, Naval Architect of the New York Shipbuilding Corporation, representing the Society of Naval Architects and Marine Engineers; Rear Admiral Robert Stocker, U. S. N., representing Admiral J. K. Robison of the Bureau of Engineering of the Navy Department, who was unable to be present; Brig. Gen. H. Taylor, representing (unofficially) the Corps of Engineers, U. S. Army; Capt. J. T. Tompkins, U. S. N., who represented the Bureau of Construction and Repair of the Navy Department in place of Rear Admiral J. D. Beuret; and Gen. George Uhler, representing the Steamboat Inspection Service of the Department of Commerce. Rear Admiral W. S. Benson, of the U. S. Shipping Board, also attended the meeting at Col. Simmons' invitation; while the Department of Commerce was represented by Ray M. Hudson of the Division of Simplified Practice. The meeting was called to order at 10:30 A. M. by Chairman Simmons, who then presented the Hon. Herbert Hoover, Secretary of Commerce.

Mr. Hoover, who made his personal interest in the movement known at its inception, expressed his views in general of the possibilities for standardization in the marine field and told of the work of the Department of Commerce in other industries. He also assured the committee that it could depend upon the hearty support of the Department which, however, would at no time attempt to dictate.

Mr. Hoover was followed by W. A. Durgin, Chief of the Division of Simplified Practice of the Department of Commerce, who illustrated his views of possibilities for standardization in shipbuilding by supplementing Mr. Hoover's remarks to the extent of amplifying what he had said about results by a detailed description of actual accomplishments, especially in manufactured lumber and bricks. While Mr. Durgin acknowledged that those industries were hardly comparable with shipbuilding, he pointed out that the principle was basic and then showed its application to ships' parts by concrete examples.

Admiral Benson then told of the two conferences in his office, one on November 16 and another on December 13, with representatives of shipbuilders and manufacturers of electrically operated auxiliaries called for the purpose of determining what, if anything, could be done in the matter of standard designs and specifications for Diesel en-

gine installations for the some five types of steam propelled vessels that the Shipping Board is offering for sale. He explained that because of the acknowledged superiority in low operating and maintenance costs of Diesel engines for ships of approximately the tonnage of those under discussion (3,000 to 9,600 tons) and the number of vessels involved, quantity production and lower costs would be possible if the equipment could be standardized. The result of the two meetings was that the more important yards in the United States have been asked by Admiral Benson to reduce their respective ideas to tentative plans and specifications for use as the basis for a third conference to be held at some convenient point, perhaps Philadelphia.

Following Admiral Benson's talk, the committee proceeded to discuss the form the permanent organization should take, with the result that it was decided to follow the British panel plan by dividing the United States into three panels—(1) Atlantic Coast and Gulf; (2) Great Lakes; and (3) Pacific Coast. Within each panel there will be a series of small sub-committees, to which will be assigned the task of determining certain specified standards. That the time and expense involved shall be reduced to the minimum, most if not all of the sub-committees will be divided territorially as to membership, with groups in the various shipping centers, the work of all to be correlated by occasional joint meetings of one or more members from each committee or by the persons who must necessarily be employed to take care of the details of the operations of the organization as a whole. Each sub-committee will be composed of men well qualified to represent the shipbuilder, the shipowner, the ship operator and the Navy, to which will be added representatives from the Army and such other branches of the government as may be concerned—the Department of Commerce always included.

In addition to the three panels described, there will be one sub-committee which will deal with the subject of standardization of things which have to do exclusively with the loading and movement of ships other than the mechanical aspect.

The work of the several sub-committees will be directed by a central committee, the membership of which will be composed of the men designated by Col. Simmons to attend the Washington meeting, augmented from time to time as circumstances may dictate. It will approve all standards before issuance, including the settlement of any differences of opinion within the several sub-committees, define the policies of the organization as a whole and in general exercise executive direction of all major operations.

The chairman was authorized to appoint two special committees, one to acquaint the executive heads of all concerns in the field with the plans of the committee to the end that their hearty support will be assured; the other to survey the range of possibilities for standardization and list all items which, in its opinion, should be acted upon. Pending receipt of its report, it was decided to proceed at once with the appointment of sub-committees to act on those things which have already been thoroughly thrashed out by the British Engineering Standards Association, including such items as pipe threads, bollards, shafting, structural steel, steel for marine boilers and steel forgings and castings.

Million in New Contracts Placed on Great Lakes

THREE contracts for new vessel construction, involving the expenditure of a total estimated at close to a million dollars, have just been awarded to Great Lakes shipyards. They provide for the building of a steel cargo vessel, 334 feet long, by the Toledo Shipbuilding Company, of Toledo, Ohio, for the Huron Transportation Company, of Marine City, Mich., and the construction of two steel Diesel electric freighters, each to be approximately 258 feet long, by the Great Lakes Engineering Works, of Detroit, for the McDougall Terminal Warehouse Company, of Duluth, Minn.; these vessels to be built under the supervision of the American Bureau of Shipping.

Moore Yard Buys Lake Ships; May Convert to Oil

THE Moore Shipbuilding Company, Oakland, Cal., has purchased the cargo steamships *Lake Frances* and *Lake Cayuga*, each of 3,000 deadweight tons, from the Shipping Board. These ships are now at Newport News being fitted out for the voyage to the west coast. It is understood that these vessels will be converted to oil burners and that they will be engaged as lumber carriers.

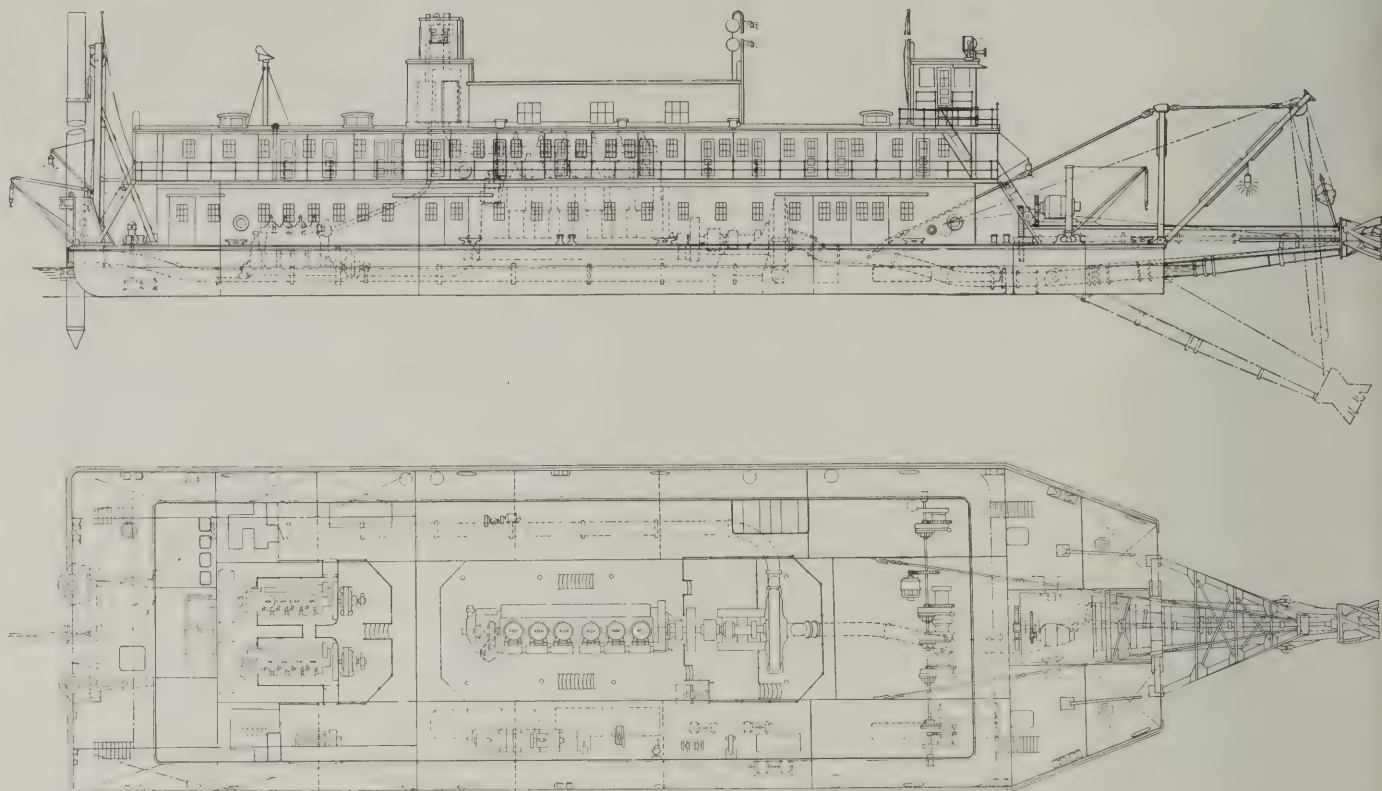
Boiler Contract Placed For Two River Steamers

THE California Navigation Company, of San Francisco, has placed a contract with the Power Specialty Company for four Foster marine boilers to be used on two rivers steamers which the company is to build for the run between San Francisco and Sacramento. Each boiler will have about 3,050 square feet of heating surface and is to be equipped with Foster Superheaters. Other details of the proposed vessels are not yet completed.

Greenbay Yard is Lowest Bidder For Five Steel Barges

THE Greenbay Dry Dock Company, Greenbay, Wis., in submitting a figure of \$72,400, for the construction of five barges and the installations of derricks, submitted the lowest bid at the opening of proposals by United States Engineer Office, Milwaukee, Wis., on December 20. The proposed boats are to be built of steel, 100 feet in length, beam 30 feet and depth 6 feet. Two of the boats are to be equipped with derricks and derrick machinery. The tenders submitted were as follows:

Greenbay Dry Dock Co.....	\$72,400
Penn Bridge Co.....	81,810
Dravo Contracting Co.....	92,040
Manitowoc Shipbuilding Corp.....	95,500
Defoe Boat and Motor Works.....	113,000



Outboard profile and general arrangement plan of 24-inch pipe line dredge to be built for United States Engineer Office, Cincinnati, O. The vessel is to be built of steel, 175 feet molded length, 50 feet molded breadth and 8 feet depth. The main dredging pump will be driven by Diesel engines and she will be fitted with electrically driven equipment. Bids are to be opened January 20, 1923. A detailed description of the vessel and auxiliaries was published in these columns on December 16.

Bids to Be Opened January 5 by Engineer Office, Cincinnati, for Diesel-Electric Pipe Line Dredge

Proposed Vessel Will Have Molded Length of 175 Feet, Molded
Breadth 50 Feet, Built to American Bureau Rules—
Equipment Will be Extensive and Modern.

SEALD proposals for the construction of one 24-inch Diesel-electric pipe line dredge will be received by the United States District Engineer Office, Cincinnati, Ohio, until January 5, 1923. The vessel is to have a molded length of 175 feet, molded breadth 50 feet and molded depth 8 feet. The dredge and equipment, unless otherwise specified, is to be built to the American Bureau of Shipping Rules. The contracting officer will furnish F. O. B. railroad cars or at wharf at contractor's yard, one dredging pump engine, 1,000 brake horsepower, non-assembled (McIntosh & Seymour type M-6-C-44), type suitable for direct connection to main dredging pump, together with mufflers with heating coils and various other auxiliary material. Bidders are invited to submit alternate proposals on at least three different makes of Diesel engines which will meet the specifications and the boat is to be delivered afloat at Fernbank, O.

EQUIPMENT

The vessel's "A" frame will be about 31 feet 10 inches long and at the upper end

will be fitted five 30-inch sheaves for wire hoisting rope for dredging ladder. There are to be two spuds, each 56 feet 9 inches long, over all, with an outside diameter of 34 inches. They are to be built of 30.6-pound steel plate.

A double-track, 10-ton traveling crane is to be provided and installed between frames 51 and 62, over the dredging pump, with a double-track traveling crane over the pumping engine between frames 31 and 51 and fitted with a 2-ton triplex trolley block, army type.

AUXILIARY ENGINES

Two auxiliary engines and generators shall be furnished and installed as shown on the plans. The engines shall be of the full Diesel, high compression, vertical, multi-cylinder, four-stroke-cycle, single acting, non-reversing, heavy duty type, capable of delivering continuously 150 kilowatts at 250 volts. The engines are to develop at least 225 brake horsepower. Accessories, equipment and spare parts for the auxiliary engines are also to be supplied.

S.S. Lake Sebago To Be Converted For Oil Burning

THE cargo steamship *Lake Sebago* of 3,000 deadweight tons, which has just been purchased by the Oregon Spruce Corporation from the Shipping Board, is to be converted to an oil burner. Specifications covering the job have been sent to both the east and west coasts. It is understood that this company is now dickering with the Shipping Board and will probably purchase more of the same class of ships. The vessel is 252 feet in length, 43 feet 6 inches in beam and draws 18 feet of water. She is fitted with triple expansion engines and cylindrical return tubular boilers.

Liner Roosevelt Repairs Awarded Robins Shipyard

THE Robins Dry Dock & Repair Company was successful bidder for general repair work on the steamship *President Roosevelt*, for the United States Lines, similar in nature to repairs on the *President Harding*, which were as follows: General repairs, minor betterments and providing of steam heat for various sections of the ship, new generators, feed water heaters, distillers and deck alterations. Bids for the work were opened Friday, December 8. The work will cost \$63,000.

Two Standard Oil Contracts Awarded N. Y. H. Plant

THE contract for repairs to the steamship *Charles H. Pratt*, of the Standard Oil Company of New Jersey, has been awarded the New York Harbor Dry Dock Company, as a result of the bids opened on December 14. The tenders submitted were:

New York Harbor.....	\$23,663
Newport News.....	23,735
Morse.....	27,085
Todd.....	33,832

The New York Harbor plant was also awarded the work of making general repairs to the steamship *Baltic*, also of the Standard Oil Company of New Jersey fleet, bids for which were opened December 13. The prices were:

Newport News.....	\$11,754
New York Harbor.....	12,060
Morse.....	15,600
Robins.....	15,909

Three "President" Ships To Be Equipped With Aero Alarm System

The Aero Alarm Company has been awarded the contracts to make extensions of the Aero Alarm System throughout the steamships *President Roosevelt* and *President Harding*, now being reconditioned at Robins Dry Dock & Repair Company, Brooklyn, N. Y.

The company has also been awarded, through the Seattle office of the Todd Shipyards Corporation, the contract for making extensions of the Aero Alarm System on the *President Harrison* now lying at San Francisco.

Radio Installed on Morgan Liners

Radio sets have been installed on the passenger steamships *Momus*, *Comus* and *Creole*, the three ships in the Morgan Line service between New York and New Orleans, according to an announcement made by L. J. Spence, director of traffic of the Southern Pacific Lines.

"There is nothing more modern than radio," said Mr. Spence, "and these installations are an earnest of the desire and intention of the officers of the line to keep the service strictly up to date in every respect."

Greenbay Dry Dock Company Low Bidder for Construction of Ten 100-Foot Steel Barges

THE Greenbay Dry Dock Company, of Greenbay, Wis., with a total price of \$107,740 or \$10,774 for each boat, was the low bidder for the construction of ten steel barges, at the opening of tenders by

American Ships Must Pay Fifty Percent Tax On Repairs Made In Foreign Ports Under New Ruling

REGULATIONS governing the carrying out of repair work on American vessels in foreign ports and providing for the payment of a fifty per cent tax for such work, except where the vessel is compelled by stress of weather or other casualty to put into a foreign harbor for repairs or purchase of equipments, have been issued by the Treasury Department, United States Customs Service. The provisions of the act are as follows:

TREASURY DEPARTMENT
United States Customs Service
New York, N. Y., December 4, 1922

TO STEAMSHIP OWNERS, COMPANIES, AGENTS, AND
OTHERS CONCERNED.

Your attention is invited to Section 466, Act of September 21, 1922, amending Sections 3114 and 3115 of the Revised Statutes which provides that "the equipments, or any part thereof, including boats, purchased for, or the repair parts or materials to be used, or the expenses of repairs made in a foreign country upon a vessel documented under the laws of the United States to engage in the foreign or coasting trade, or a vessel intended to be employed in such trade, shall, on the first arrival of such vessel in any port of the United States, be liable to entry and the payment of an ad valorem duty of 50 per centum on the cost thereof, in such foreign country; and if the owner or master of such vessel shall wilfully and knowingly neglect or fail to report, make entry, and pay duties as herein required, such vessel, with her tackle, apparel and furniture, shall be seized and forfeited."

If the owner, or master of such vessel, however, furnishes good and sufficient evidence that such vessel, while in the regular course of her voyage, was compelled, by stress of weather or other casualty, to put into such foreign port and purchase such equipments, or make such repairs, to secure the safety of the vessel to enable her to reach her port of destination, then the Secretary of the Treasury is authorized to remit or refund such duties, and such vessel shall not be liable to forfeiture, and no license or enrollment and license, or renewal of either, shall hereafter be issued to any

such vessel until the collector to whom application is made for the same shall be satisfied, from the oath of the owner or master, that all such equipments and repairs made within the year immediately preceding such application have been duly accounted for under the provisions of this and the preceding sections, and the duties accruing thereon duly paid; and if such owner or master shall refuse to take such oath, or take it falsely, the vessel shall be seized and forfeited."

Equipments. The term "equipment" includes portable articles necessary or appropriate for the navigation, operation, or maintenance of a vessel, such as rigging, sails, anchors, chains, cables, tackle, boats, repair parts, life-saving apparatus, nautical instruments, signal lights, lamps, furniture, carpets, table linen, table ware, bedding, arms, munitions, and articles of a similar nature, but not such articles as are permanently incorporated in or permanently attached to its hull or propelling machinery and does not constitute consumable supplies.

Sea Stores. Sea stores embrace all articles for the use and consumption of the passengers and crew of a ship upon its voyage and all commodities which are consumed in their use.

(1) The Department advises that articles such as soda, kerosene, varnish, turpentine, etc., which are consumed in their use, are not subject to duty.

(2) Articles which are purchased for repair purposes on a vessel, such as paint, for example, though coming under the head of sea stores, are subject to duty.

Ship's Stores and Equipment. Ship's stores and equipment are held by the Department to be identical terms.

Repairs and Materials. Repairs made at the port of destination, when such repairs are due to stress of weather during the voyage, are not exempt from duty. Materials drawn from the vessel's equipment or sea stores and used for repairs are dutiable.

Labor. If the labor is performed by other than the ship's complement, charges for labor should be included in the value of such repairs. If the labor is performed by members of the ship's complement and an additional compensation is paid them for such repair work, such additional compensation constitutes a part of the cost of the repairs and is dutiable.

Cleaning. Cleaning and scrubbing of parts of the ship's equipment, such as stoves, window curtains, etc., does not constitute repairs and is not subject to duty.

Entry. Consumption form of the entry will be used and it is very essential to the expeditious handling of repairs under Section 466 that a statement of the cost of repairs made abroad be filed at the time of entry. The consumption entry should be filed and the duties, if any, paid or secured to be paid, immediately after entry of the vessel.

Protest. If dissatisfied with the decision of the collector as to the rate and amount of duties assessed, the importer or owner, or his agent, may file a written protest as provided for in Section 514 of the Tariff Act of 1922, and have the question or questions determined by the Board of United States General Appraisers.

Prompt and cheerful compliance with these regulations is respectfully solicited.
(Signed) H. C. STUART, Acting Collector.

Greenbay Dry Dock Co.....	Greenbay, Wis.	\$10,774.00
Dubuque Boat & Boiler Works.....	Dubuque, Iowa.....	11,200.00
Rock Island Bridge & Iron Works.....	Rock Island, Ill.....	12,900.00
Riter-Conley Co.	Pittsburgh, Pa.	13,110.00
Nashville Bridge Co.....	Nashville, Tenn.....	13,270.00
Independent Bridge Co.....	Pittsburgh, Pa.....	13,590.00
Dravo Contracting Co.....	Pittsburgh, Pa.....	13,850.00
Penn Bridge Co.....	Beaver Falls, Pa.....	13,880.00
Greiling Brothers Co.....	Greenbay, Wis.....	14,700.00
Midland Barge Co.....	Midland, Pa.....	15,000.00
American Bridge Co.....	Pittsburgh, Pa.....	15,850.00
Midwest Boat & Barge Co.....	Grafton, Ill.....	15,998.60
Lakeside Bridge & Steel Co.....	North Milwaukee, Wis.....	20,470.00

Among the Steamship Operators

Beginning this month, the Garland Steamship Corporation will add seven modern steamers, totaling more than 59,000 tons, to their coast to coast service via the Panama Canal. There will be sailings every two weeks both east and west bound, the ports of call being New York, Baltimore and Norfolk on the Atlantic and Los Angeles, San Francisco, Seattle and Portland on the Pacific, the vessels maintaining the sailings as to ports in the order named.

Several reductions and changes in prevailing freight rates have been authorized by the Continental Freight Conference. Among them were the general cargo rate to Antwerp and Rotterdam, which was reduced from 75 cents and 40 cents a hundred pounds to 70 cents and 35 cents. To Hamburg and Bremen the general cargo rate was lowered from 82½ cents and 45 cents to 75 cents and 37½ cents.

November marked the inauguration of a semi-monthly service from San Francisco and Los Angeles to the West Coast of Mexico with the sailing of the German steel motorship *Principio*, a twin screw vessel of 1,000 tons deadweight, owned by the United Fruit Distributors, Inc., of Los Angeles. Refrigerator equipment has been placed on the vessel for the handling of bananas, which will be the main cargo northbound. The vessel was purchased recently in Hamburg and the possibilities are that her registry may be changed.

Gulf shipyards have reduced drydocking rates from 20 cents a ton for the first day and 15 cents thereafter to 16 and 14 cents.

Vessels of the Commercial Pacific Line in the coast to coast trade now call at Norfolk for cargo. Hasler & Co. are handling the ships there. The Commercial Line is an old established concern, now operating out of Baltimore, New York, Philadelphia, Los Angeles, San Francisco, Portland, Ore., Vancouver and Seattle. Including the Isthmian Line, which has had two ships at Norfolk recently, the number of coast-to-coast lines giving service at Hampton Roads will be six.

Sailings from Boston in the London, Hull and Leith service of the Oriole Steamship Lines will in the future, include a call at Dundee, Scotland, to discharge and load freight. The North Atlantic & Western Steamship Company of Boston is agent for the operating company.

Sailings from Boston to the Far East have been arranged by the Toyo Kisen Kaisha, Japanese Steamship Company, and the service will be permanent, if conditions warrant.

The Baltimore Steamship Company has decided to add a passenger feature to its line to Porto Rico. This step has been taken because of the growing business relations between Baltimore and the West Indies. The *Governor John Lind*, upon its arrival at Baltimore from San Juan, went to the plant of the Baltimore Dry Docks to be fitted with 16 staterooms for passengers. It is expected that the running mate of the *Lind*, the *Major Wheeler*, will also be re-conditioned in a similar manner.

W. J. Love, vice-president and general manager of the United States Shipping Board Emergency Fleet Corporation, in charge of traffic, has announced the inauguration of a new line of Shipping Board passenger steamers to be operated from Pacific Coast ports to the east coast of

South America, via the Panama Canal. The new service will be managed by Swayne & Hoyt, of San Francisco, as agents for the Board, and, in addition to the three cargo vessels now allocated to them by the Fleet Corporation, they will operate the fast passenger steamers *President Hayes*, *President Harrison* and the *Susquehanna*. In addition to passenger accommodations, the last named steamships are equipped for miscellaneous and refrigerator cargoes. The ports of call will be Seattle, Wash.; Portland, Ore.; San Francisco, Cal.; Panama Canal; Porto Rico; Rio de Janeiro; Montevideo and Buenos Aires, on southbound trips, and in addition to these ports, the vessels will stop at other east coast South American ports on the northbound trip for coffee. This line will open a new territory for Pacific Coast merchants and products. It will tend to develop the fruit trade of the northwest with the east coast of South America, particularly Brazil, where a marked demand is noted for American apples. It is proposed to install a service whereby sailings will be made every three weeks in each direction. Business men and tourists who desire to visit the west coast of South America can take this new line to the Panama Canal and then transfer to an American vessel running to ports on the west coast to South America. It will also give direct communication with Porto Rico and from Porto Rico to all east coast ports.

Effective in November, Mrs. E. R. Clotworthy was appointed director of steamer and passenger service, in charge of service on steamers and local passenger business, between Baltimore and Norfolk, including solicitation and advertising in connection therewith, reporting to W. L. Seddon, of the Baltimore Steam Packet Company.

Following meetings of the North Atlantic Conference in New York and Brussels, the steamship lines agreed to make certain reductions in the first class fares on all Atlantic lines except those going to the Mediterranean. There will be very small reductions on liners such as the *Majestic* and *Aquitania*, due to heavy operating expenses, and it will be very little more than 5 per cent on the Liverpool ships like the *Baltic* and *Carnania*. The chief reduction will be in the minimum first cabin rates of the older ships like the Red Star liners *Kroonland* and *Finland* and the Holland-American liners, *Noordam* and *Ryndam*. This will be more than 12 percent, considering speed. There will be no reduction in the second and third class fares on the Atlantic lines.

The Far East Steamship Company, 78 Broad Street, New York, started a service late in December from New York to Hong Kong, Kobe and other Far East ports. One steamer, the *Culgoa*, has been acquired under the American flag and negotiations are under way with Chinese interests for another vessel.

The Shipping Board has announced the sale of two tankers and one steel cargo vessel. The tankers are the *Utacarbon* and the *Cathwood*, both 10,078 deadweight and 7,076 gross tons, sold to the Union Oil Company of Los Angeles, while the steel cargo vessel is the *Delvosa*, 5,125 deadweight tons and 3,474 gross tons, sold to the Alaska Steamship Company of Seattle, Wash.

The East Coast South American Conference met recently and reduced the rate on

paint to Montevideo and Rio de Janeiro from \$20 to \$16 a ton.

A successful trial test was made of the steel steamship *State of Maryland*, under construction at the Pusey & Jones Company for the Old Bay Line. A speed of 18.6 knots was attained. The vessel is a sister ship of the *State of Virginia*, launched some months ago by the Pusey & Jones Company. Both vessels will be used on Chesapeake Bay.

The Three Star Line has arranged for a resumption of its full service to North African ports, Marseilles and Genoa.

The steamer *Fred G. Hartwell*, building for the Franklin Steamship Company, H. K. Oakes, manager, was successfully launched at Lorain, O. The *Hartwell*, which will be completed this month, will be 617 feet overall, 596 feet keel, 64 feet beam and 33 feet deep. She will have a triple expansion engine and steam will be furnished by three Scotch boilers, 14 feet in diameter and 11 feet long.

For the purpose of establishing the fastest and best service between Seattle and the Orient, the five large trans-Pacific liners, operated by the Admiral Oriental Line, were placed on a 12-day schedule beginning December 9. The ships formerly sailed every two weeks, remaining in Seattle, the home port, for 18 days.

Business Notes

The Ingersoll-Rand Company and the A. S. Cameron Steam Pump Works announce the opening of a branch office at 718 Ellicott Square Building, Buffalo, N. Y. This new office is equipped to render full service to those interested in air, gas and ammonia compressors, vacuum pumps, turbo blowers and compressors, condensers, oil and gas engines, pneumatic tools, rock drills, centrifugal and direct-acting pumps and other products manufactured by these companies.

It is announced from Cleveland, Ohio, that the following companies are now doing business under the name of The Columbia Steamship Company, as a result of consolidation: The Hubbard Steamship Company, Montreal Transit Company, Castile Transit Company, Miller Transit Company, Hanna Transit Company, Norton Transit Company, Ft. Henry Transit Company, Ottawa Transit Company, Bristol Transit Company and Yosemite Transit Company.

The Wilson Welder & Metals Company is now represented exclusively in Maryland, Virginia and the District of Columbia, by the Alexander Milburn Company of Baltimore. A large stock of color-tipped welding metals and plastic-arc welding machines is available at this point for distribution throughout the territory and a complete demonstration plant is in operation.

Mr. A. E. Jones, sales engineer in the New York office of the Terry Steam Turbine Company, has accepted a position with W. B. Connor, Inc., 90 West Street, New York City, in a similar capacity. Mr. Jones began his new duties January 1, 1923.

Mr. A. A. Heller has taken over the management of the International Oxygen Company in place of Mr. L. W. Hench, secretary and general manager, resigned.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Steamer Overhauled, Portland, Ore.—Steamer Wawalon was placed on drydock at Portland for overhauling.

Tug Drydocked, Mobile, Ala.—The Alabama Dry Dock Company replaced broken propeller wheel on tug Hukey.

Repairs to Boiler, Oakland, Cal.—Santa Fe ferryboat San Pablo went to the Moore yards for repairs to her boilers.

Motorship Drydocked, Portland, Ore.—Motorship La Merced was lifted at the port drydock plant to be overhauled.

Tug Repaired, Mobile, Ala.—Tug James Dougherty went to Todd repair plant, Mobile, for repairs and general overhauling.

Drydocking Contract, Seattle, Wash.—The Todd Drydocks have received the contract for drydocking the Remus for repairs.

Steamers Drydocked, Portland, Ore.—Steamers West O' Rowa and Wawalong went on drydock at Portland for overhauling.

Schooner Repairs, Philadelphia, Pa.—The American schooner Mabel Gale went to Cramps' Shipyard for miscellaneous repairs.

Repairs to Plates, Superior, Wis.—Steamer Cayuga went to Superior to be drydocked for repairs to eighteen damaged plates.

Government Dredge Repaired, Portland, Ore.—Government dredge Col. P. S. Michie went to Portland to be drydocked for repairs.

Steamer Repaired, Brooklyn, N. Y.—Steamer Susquehanna was awarded the Atlantic Basin Iron Works for repairs at \$15,290.

Repairs and Overhauling, Seattle, Wash.—Admiral liner H. F. Alexander was placed on drydock for minor repairs and overhauling.

Tanker Drydocked, Chester, Pa.—The tanker J. M. Pew, of the Sun Oil Company's fleet, went into drydock at the Sun Shipyards.

Schooner Repairs, Orange, Tex.—The schooner Thelma has been shifted to the Southern Dry Dock yard to be hauled out for repairs.

Coast Guard Cutter Repaired, Fore River, Mass.—Coast Guard cutter Tampa went to the Fore River plant to undergo necessary repairs.

Miscellaneous Repairs, Chester, Pa.—The Shipping Board steamship West Inskip went to the Sun Shipyards for miscellaneous repairs.

Dredge Drydocked, Portland, Ore.—Dredge Portland, wrecked in collision, was towed to drydock to be salvaged of machinery and equipment.

Steamer Drydocked, San Francisco, Cal.—General Petroleum Company's steamer Hambro has been placed in drydock to be reconditioned.

Contract Awarded, Brooklyn, N. Y.—Alderton Dry Dock Company was awarded the contract for repairs to the steamship West Lashaway; price \$4,800.

Repair and Painting, Philadelphia, Pa.—Southern Steamship Company's vessel Algiers went to Cramp's yard to be drydocked for repairs and painting.

Overhauling of Lightship Relief, Winslow.—Lightship Relief No. 92 has been sent to Winslow to undergo overhauling, repairing and annual inspection.

Towboat Inspection, Pittsburgh, Pa.—Towboat Twilight, of the Rogers Sand Company fleet, underwent boiler repairs and was inspected shortly after.

Contract Awarded, Winslow.—The contract for repairing the motorship Anvil has been let to the Winslow Marine Railway and Shipbuilding Company.

Steamship Reconditioning, Brooklyn, N. Y.—The Morse Dry Dock & Repair Company was successful bidder, at \$168,270, for reconditioning steamship Reliance.

Steamer Drydocked, Seattle, Wash.—The steamship Memnon of the General Steamship Corporation's South American service has been drydocked at Seattle.

General Repairs, Baltimore, Md.—The Maryland Dry Dock Company received the contract for general repairs and painting on the Norwegian steamship Tajana.

Barges Repaired, Mobile, Ala.—Mississippi-Warrior Service barges No. 103, 205 and 210 were awarded to the Alabama Dry Dock Company for repairs.

Miscellaneous Repairs, Philadelphia, Pa.—The United States Army tug Vidette has gone to Cramps yard for miscellaneous repairs as a result of a collision.

Steamer Drydocked, Mobile, Ala.—Todd plant, Mobile, was awarded the contract to drydock and make general repairs to the Waterman steamer Clavarack.

Alteration Job, Oakland, Cal.—Contract for extensive alterations on the Associated Oil tanker Kewanee was awarded to Moore Shipbuilding Company, at \$18,900.

Calking of Deck, San Francisco, Cal.—Crowley Shipyard was awarded the contract, as low bidder, for work of calking main deck of the steamer Admiral Dewey.

Repairs to Steamer, Toledo, Ohio.—Steamer Arcurus, damaged in collision in the Detroit River, has gone to the yard of the Toledo Shipbuilding Company for repairs.

Contract Awarded, Staten Island, N. Y.—The New York Harbor Dry Dock Company has been awarded repairs to the Shipping Board steamship Waukegan on a bid of \$7,570.

Contract Awarded, Oakland, Cal.—The Moore Shipbuilding Company was awarded the contract for drydocking and other work on the Pacific Mail steamer Point Judith.

Steamer Drydocked, Oakland, Cal.—China Mail steamer Nanking went to the Moore yard to be drydocked to have new tailshaft installed and to be generally overhauled.

Repairs to Keel, Eagle Harbor, Wash.—Steamship Anyox, of the fleet of the Coastwise Steamship and Barge Company, has been shifted to Eagle Harbor for repairs to her keel.

Schooner Drydocked, Savannah, Ga.—Sally Wrenn has been placed on drydock at the Wilkinson Marine Railway and Dry Dock Company's plant to undergo survey and minor repairs.

Overhauling of Ship, Seattle, Wash.—The trans-Pacific liner President Jackson went to Todd Dry Docks for a thorough overhauling and to have her keel scraped and painted.

New Tail Shaft, Brooklyn, N. Y.—Work of supplying and machining new tail shaft for the steamship Munamar was awarded to the Robins Plant of the Todd Shipyards Corporation.

Repairs to Steamship, Staten Island, N. Y.—Contract for repairs to steamship Swiftscout has been awarded to the Staten Island Shipbuilding Company on tender of \$9,350 and 9 days.

Proposed Boat, Cincinnati, O.—Captain Gordon Greene, of Cincinnati, contemplates building new stern wheel, all steel, river steamer, 170 feet long and of the Mississippi River type.

\$6,500,000 Repair Work, New York.—\$6,500,000 worth of ship reconditioning work will be done early this year on the steamships Agamemnon, Mount Vernon, President Grant and America.

Two Shipping Board Contracts Awarded, Brooklyn, N. Y.—Shipping Board awarded steamship Zarembo to the Alderton Yards at \$2,000, and the Half Moon to the Crystal Iron Works, at \$1,043.

Liner Overhauled, San Francisco, Cal.—Pacific Mail liner President Lincoln went to the Bethlehem plant for general overhauling. All machinery and boilers were taken down and inspected.

General Overhauling, Newport News, Va.—The Merchants and Miners' Transportation Company's passenger ship Merrimack has gone to Newport News to be drydocked for general overhauling.

Contract Awarded, San Francisco, Cal.—The Eureka Boiler Works was awarded the contract for retubing work on the Matson motorship Annie Johnson and other minor adjustments on the vessel.

Contract Awarded, Brooklyn, N. Y.—Robins Dry Dock & Repair Company was awarded the contract for repair work on the steamship President Roosevelt, for the United States Lines. Price \$63,000.

Contract Awarded, Brooklyn, N. Y.—The Foreign Transport & Mercantile Corporation of New York awarded the contract for repairs to steamship Manitowoc to Alderton Dry Docks Company at price of \$3,797.

Contract Awarded.—The Bethlehem Shipbuilding Corporation has been awarded the contract by the United States Shipping Board to repair the steamship West Loquassak, cost to be in excess of \$10,000.

Contract Awarded, Brooklyn, N. Y.—Robins Dry Dock & Repair Company received the contract for reconditioning the steamship President Harding, the work providing for general repairs, minor betterments, etc.

Transport Reconditioning, San Francisco, Cal.—Transport Logan went to Bethlehem Yards, San Francisco, for extensive alterations on vessel's passenger accommodations and life-saving equipment. Price \$16,989.

Contract Awarded, Brooklyn, N. Y.—The Martha Washington, purchased by the Cosulich Line from the Shipping Board, has been taken to the yard of the Robins Drydock and Repair Company for a thorough reconditioning.

Reconditioning Work, Staten Island, N. Y.—The Staten Island Shipbuilding Company was awarded the contract for reconditioning work on the steamship Munamar, of the Munson Line, including about 400 feet of seam calking.

Aero Alarm System Installation.—The Aero Alarm Company has been awarded contracts to make extensions of the Aero Alarm System throughout the steamships President Harding, President Roosevelt and the President Harrison.

Boiler Installed on Government Tug, Portland, Ore.—Government tug Wilson, controlled by Washington district, corps of engineers, U. S. A., went to Portland to have new boiler installed, at plant of Willamette Iron & Steel Works.

Repairs, Oakland, Cal.—Liner President Taft went to Moore Shipyard for repairs to her machinery in excess of a cost of \$25,000. Work included retubing of her boilers and repairs to her condensers. Other work was on the main engines.

Reconditioning Steamer, West Coast.—A large sum will be expended in reconditioning the transport Sherman, purchased by the Los Angeles Steamship Company for \$60,000, for the Los Angeles-Honolulu run, to replace the City of Honolulu.

Repairs to British Schooner, Philadelphia, Pa.—Philadelphia Ship Repair Company was awarded a contract by T. H. Warren & Company to repair several bow plates and beams in the British schooner James William, damaged in collision.

Shipping Board Contracts, Maryland.—The Shipping Board awarded steamer Homestead to H. E.

Crook Company, at \$2,392, for repairs; and the steamship Chebaulip to the Maryland Dry Docks Company, at \$594, for docking for survey.

Steel Tug Hull, Midland, Pa.—Captain Oscar F. Barrett, of the Barrett Line, Cincinnati, O., let a contract to the Midland Barge Company, Midland, for the construction of a steel hull for a stern wheel towboat 175 feet long by 38 feet beam.

Two Contracts Awarded, Staten Island, N. Y.—Contracts for repairs to the steamship Charles H. Pratt and the steamship Baltic, both of the Standard Oil of New Jersey, were awarded the New York Harbor Dry Dock Company. Prices \$23,663 and \$12,060, respectively.

Contract Awarded, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company has been awarded the contract for extensive repairs to the 1,133 net ton steam freighter Yumuri, of the Ward Line. The work includes extensive repairs to machinery and a great deal of hull work.

Contract Awarded, Mobile, Ala.—The United Fruit Company awarded a contract to the Todd Shipbuilding & Dry Dock Company, Mobile, for repairs, involving approximately \$50,000, to the steamship San Mateo. Work consisted of conversion from coal to oil burning and general repairs.

Contracts Awarded, Staten Island, New York.—The New York Harbor Dry Dock Company was awarded three repair contracts on Shipping Board vessels; two on the West Golomska and the other on the steamship Scottsburg. Prices were respectively \$2,620, \$2,648 and \$1,343.

Two New Ferryboats, Philadelphia, Pa.—Pusey & Jones Shipbuilding Company, of Wilmington, Del., has been awarded a contract to build two all-steel ferryboats for the Philadelphia & Reading Railway. They will be 200 feet long, and will ply between Philadelphia and Camden and will be the fastest ferryboats on the Delaware.

Jahncke Repairs, New Orleans, La.—Contracts recently awarded the Jahncke Dry Dock Company are as follows: Steamship Salaam, to undergo periodical surveys and minor repairs; Vaccaro Brothers' tanker Caloria, overhauled; Standard Oil tug Bonita, overhauled; and Magnolia Petroleum Company's barge Chagres, overhauled.

Extensive Overhauling, Eagle Harbor.—The motorship Coolcha, owned by the Pacific Freighters Company, went on the ways of the Winslow Marine Railway & Shipbuilding Company, Eagle Harbor, to undergo an extensive overhauling. The schooner Vancouver and the steamship Pacifico also went on the ways of the Winslow Marine Railway & Shipbuilding Company.

Miscellaneous Repairs, Mobile, Ala.—The Texas Company steamer New Jersey has been placed on the docks of the Alabama Dry Dock & Shipbuilding Company for repairs. The work included: renewing and hardening approximately one thousand rivets scattered about the shell; tanks; rudder arms and stern frame; number of plates faired and two coats of paint below light load line.

Construction of Tank Barge, Chester, Pa.—The Sun Shipbuilding Company received the contract for the construction of a twin screw Diesel propelled steel bulk oil barge for Standard Transportation Company of New York, subsidiary of the Standard Oil Company. Approximate total cost \$300,000. Dimensions, 254 feet length over all, 37 feet 6 inches molded beam and 14 feet molded depth.

Motor Schooner Drydocked, Mobile, Ala.—The Alabama Dry Dock Company was awarded the contract for repairs to the motor schooner Esperanza. The work consisted of the following: Cleaning, painting, repairs to damaged planking on port side forward, removing three sections of keel, renewing keel shoe, calking of vessel from keel to covering board, lifting and tightening of rudder, and painting bottom with copper paint.

Steamer Construction Contract Award, Bethlehem, Pa.—The contract for the construction of a new paddle wheel steamer for the Hudson River Day Line was awarded the Bethlehem Shipbuilding Corporation on a bid of \$742,140. Vessel was designed by J. W. Millard & Brother, naval architects, 17 State street, New York City. Dimensions are: over all length 333 feet, extreme breadth 76 feet and depth molded to main deck at side of guard 13 feet 8 inches.

Yacht Contract Held Up for Present, New York.—It is learned that the tenders received for the construction of a steel auxiliary schooner yacht, having a length of 125 feet and propelled by a 200 to 250

horsepower oil engine, for William P. Adams, of Chicago, have been set aside, the contract having been held up for the present at least. It is understood that the bids ranged from \$175,000 to \$375,000. The vessel was designed by Theodore E. Ferris, naval architect and marine engineer, 30 Church street, New York City, N. Y.

Alabama Dry Dock Work, Mobile, Ala.—Following contracts were awarded the Alabama Dry Dock & Shipbuilding Company: Texas Company's motor vessel Solitaire, to have bottom examined, both tail shafts drawn for inspection, strut bearings re-wooded, shafts replaced, minor leaks in way of engine room calked and made tight, pitted places on stern plates on both port and starboard sides built up by electric welding and to be painted; S. S. San Antonio, replacing of tail shaft and propeller; barge Oriole, voyage repairs.

Steamers Repaired, Mobile, Ala.—The following steamships have been awarded to the Alabama Dry Dock & Shipbuilding Company; stern wheel river steamer Volcano, operated in Mississippi-Warrior Service, for calking bottom, repairs to port rudder, repairs to machinery heater-pipe system, iron work on rudders, repair work about the cabin and installation of new radio room; Shipping Board steamship Braddock, for renewing several hundred leaky rivets in her bottom and considerable bulkhead repairs; Lake Gunn, for general repairs.

SHIPYARDS AND DRYDOCKS

Yard and Plant Improvement, Beaumont, Tex.—The Pennsylvania Shipyards, Inc., of Beaumont, Texas, formerly the Beaumont Shipbuilding Company, have completed their improvement to the old plant. They dredged a 28-foot channel to their docks and raised the fill about 6 feet to bulkheads, in all covering about 10 acres. The improvements include newly arranged and well equipped machine shop, plate shop, blacksmith and wood working shop. The 3,000-ton railway is complete and in operation.

PORT IMPROVEMENTS

Contract Awarded, New Haven, Conn.—New England Steamship Company, Bridge street, will rebuild dock on Bridge street, wood and steel. Price \$30,000.

Channel Improvements, Liberty, Tex.—District Engineer of Galveston is making plans for channel improvements from Liberty to mouth of Trinity River.

Terminals, Oakland, Cal.—The Southern Pacific Company, 65 Market street, San Francisco, Cal., has purchased 300 acres of waterfront land at Oakland, on which they will construct an extensive port terminal.

Contract Awarded, Kincardine, Ont.—Key Brothers, Kincardine, was awarded the contract to rebuild piers, stone and cement work, by the Department of Public Works, Ottawa, Canada. Engineer's estimate \$26,000.

Grain Elevator, Goderich, Ont.—Goderich Elevator & Transit Company, 85 Horton street, London, is having plans prepared for reinforced concrete grain elevator, along harbor; 1,000,000 bushels capacity; price \$250,000. Private plans.

New Dock, New Orleans, La.—Early next spring the Board of Port Commissioners of New Orleans will spend \$1,500,000 on the construction of a 2,000-foot modern shedded pier on the Industrial Canal, according to plans now being prepared.

Dock, Vancouver, B. C.—S. E. Junkins & Company, 837 Hastings street W., was awarded the contract for building a new dock 800 feet long, 333 feet wide, timber on creosoted piles or concrete slab on concrete piles (7,000,000 feet) by Canadian Pacific Railway, Seymour street. Price \$2,000,000.

Seawall, New Orleans, La.—New Orleans Levee Board, New Courthouse Building, plans 26,000 feet seawall from West End to Seabright, reclaiming 48,475,000 square feet of ground, of which 26,000,000 square feet will be devoted to public use, 4,495,000 square feet for streets and sidewalks, leaving

17,981,000 square feet for suburban development, including 70,200 cubic yards of reinforced concrete \$1,400,000, 560,000 feet creosoted piling \$252,000, lumber \$175,000, 750,000 pounds of iron and hardware \$22,500, and 16,262,500 cubic yards of hydraulic fill \$975,000.

New Pier, Hoboken, N. J.—Plans have been prepared for building of a new steel and concrete pier in Hoboken for the accommodation of the Leviathan, under supervision of Admiral W. S. Benson, Shipping Board Commissioner. Plans call for a double deck structure about 1,200 feet long and to cost between \$3,000,000 and \$4,000,000.

New Pier, Hoboken, N. J.—The contract for removing Piers 5 and 6 to make room for the new pier for the Leviathan was awarded to the Robins-Ripley Company, of 50 Church street, which estimates the cost approximately \$35,000. Dredging the slip to a depth of 45 feet will be done by the Morris & Cummings Dredging Company, of 17 State street, New York, for about \$60,000.

Harbor Improvements, Norfolk, Va.—United States engineer for rivers and harbors wants \$500,000 for new work on the Norfolk harbor during the fiscal year ending June 30, 1923, according to the engineer's report filed with Congress, December. The report shows that the completion and widening of the forty-foot channel from Hampton Roads to the Belt Line bridge will take the \$500,000 asked for. Other needed improvements asked for are: the inland waterway from Norfolk to Beaufort, \$500,000; dredging the forty-foot channel in Thimble Shoals from Hampton Roads to the sea, \$74,560; keeping of the channel of the James River at a minimum depth of eighteen feet and from 100 to 200 feet wide, \$40,000; improvement during the coming fiscal year in the Pagan River, \$2,000; and work on the Nansemond River to make it more navigable, \$42,000. This report goes into detail as to the waterborne commerce of Hampton Roads and its tributaries. The report goes into the history of harbor development here, also, and carries the figures all the way down the coast. It shows Hampton Roads as substantially a commercial leader. The total improvements asked for in this report amount to \$1,123,560, which includes \$500,000 for the Norfolk channel widening, the \$50,000 for maintenance work, and the \$74,560 for widening the channel at Thimble Shoals.

NEW INCORPORATIONS

The Royal Barge Line, \$750,000, incorporated in Delaware, to do business in barges.

The Coastwise Oil and Transport Company, Philadelphia, capital \$3,000,000, incorporated under Delaware laws.

The Motorship Transportation Company, capital \$10,000,000, incorporated in California, to carry fruits between Pacific and Atlantic ports.

The Sagadahoc Steamship Corporation, capital \$300,000, chartered at Albany. Incorporators: E. E. Baldwin, F. V. Barnes and R. F. Weeks.

The Bimini Steamship Corporation, capital of \$100,000, chartered under Delaware laws by John McGovern, E. Brouse and E. Levison, of New York.

King Boat Works, West Highlands, N. J., \$200,000, incorporated in New Jersey. Incorporators: George C. King, Harry N. Johnson, Leslie J. King and Stewart B. King.

Moore & McCormack Company have incorporated under Delaware laws for \$100,000 each the Commercial Traveler Steamship Company, Ltd., and the Commercial Spirit Steamship Company, Ltd.

GOVERNMENT WORK

Cranes, Puget Sound, Wash.—Specification 4753, Bureau of Yards and Docks, Navy Department, Washington, D. C., plans to purchase electric elevator cranes.

Extension to Dock, Boston, Mass.—Specification 5,753.—Bureau of Yards and Docks, Navy Department, Washington, D. C., plans extension to Naval drydock at Boston.

Contract Awarded, Beaver Falls, Pa.—The contract for the construction of three steel lump scows, bids for which were opened November 7, by the United States Engineer Office, Buffalo, N. Y., has been awarded the Penn Bridge Company, Beaver Falls, Pa. The company's price was \$92,120.

Contract Awarded, Gloucester, Mass.—Department of Public Works, State House, Boston, has awarded the contract to construct 1,008-foot granite faced concrete seawall, 47-foot concrete seawall, 76-foot granite seawall at Gloucester, to Bay State Dredging Company, 62 Condor street, East Boston (Boston P. O.); price \$54,630.

BUSINESS NOTES

Mr. A. A. Heller has taken over the management of the International Oxygen Company in place of Mr. L. W. Hench, secretary and general manager, resigned.

Mr. George Macnoe, Manager of the Boston Office of the W. B. Connor, Inc., has been recalled to New York to take charge of the Contractors' Sales Department, handling heating and pumping equipment.

Mr. A. E. Jones, sales engineer in the New York Office of the Terry Steam Turbine Company, has accepted a position with W. B. Connor, Inc., 90 West street, New York City, in a similar capacity. Mr. Jones assumed his new duties January 1, 1923.

The Wilson Welder & Metals Company is now represented exclusively in Maryland, Virginia and the District of Columbia, by the Alexander Milburn Company of Baltimore. A large stock of color-tipt welding metals and plastic-arc welding machines is available at this point for distribution throughout the territory and a complete demonstration plant is in operation.

The Roller-Smith Company, 233 Broadway, New York, N. Y., announces the appointment of the Electric Material Company as its agent in the State of Washington and parts of Oregon and Idaho. The Electric Material Company has recently opened an office in the Hincley Building, Seattle, and will handle the Roller-Smith Company's lines of electrical instruments, circuit breakers and radio apparatus in that territory. The Seattle office is in charge of Mr. R. F. Robinson.

The capital stock of the Southern Dry Dock & Ship Building Company, Orange, Tex., has been increased from \$100,000 to \$200,000, and all the new stock has been subscribed for. According to advices received, the principal business of the company has changed from shipbuilding to car building, hence the name has been changed in line with the greatest activities; namely, the "Orange Car and Steel Company." The personnel of the officers and management remains the same.

FOREIGN ACTIVITIES

New Dry Dock, Belgium.—The Belgium Government has allocated a sum of 13,000,000 francs for the construction of a new dry dock at Langerbrugge, near Ghent.

Order Placed, England.—Runciman & Company, of Newcastle, England, have placed an order for the construction of two large steamers with John Readhead of South Shields.

New Service, Germany.—The Hugo Stinnes Line has started a monthly service, with six new oil burning passenger and freight vessels of 9,000 to 12,000 deadweight tons, between Hamburg, Rotterdam, Dover, Antwerp and Naples and ports in China, Japan and the Philippines.

New Fireboat, France.—According to a report from the American Consulate, the Chamber of Commerce of Marseilles, France, has recently purchased a new fireboat, costing 400,000 francs, for the protection of the harbor. The new vessel has oil burning motors and can be set in motion at a moment's notice.

Commercial Harbor, Kiel.—The North Harbor of the port of Kiel, located on the Kiel Canal near the

Prince Henry Bridge, was inaugurated October 11, 1922. This small harbor, with a grain elevator of 12,000 tons capacity, is the first step in the realization of the many schemes to make Kiel a commercial port.

New Floating Dry Dock, Southampton, England.—Directors of the London and Southwestern Railway Company, which controls much waterfront property at Southampton, have sanctioned construction of a floating drydock at the port large enough to lift the Majestic. The new dock will be as large as those at Boston and Hamburg.

Contract Award, England.—Messrs. Vickers, Ltd., England, have been awarded a contract to build a new vessel for the Orient Steam Navigation Company. The ship will have a length between perpendiculars of 630 feet, molded breadth 74 feet and gross tonnage approximately 20,000. Her accommodations will include 600 first class and 1,300 third class passengers.

Oil Conversion, Nagasaki, Japan.—The Fukuoka Nichi Nichi reports that, according to information received at Moji and announced by the Department of Commerce, the Nippon Yusen Kaisha has adopted the furnaces of the Lisbon-Marú and four other steamers for the consumption of both coal and oil, owing to the cheapness of the latter. The Toba-Marú and Mayebashi-Marú had previously undergone similar alterations so that seven of the company's steamers are now capable of using oil or coal.

Dockyard Employees' Holiday, Nagasaki, Japan.—In order to avoid wholesale discharge of its employees at its shipyards at Nagasaki, the Mitsubishi Shipbuilding Company has inaugurated a system whereby its employees are compelled to take a week's holiday, in turn, during which time they are to be given 60 per cent or more of their wages. Men called upon to return to work for a short time during the holiday will receive a larger percentage of their pay, says Vice Consul Correll in a report to the Transportation Division of the Department of Commerce.

Contract Awarded, Scotland.—Messrs. Ramage and Ferguson, Ltd., Leith, were awarded a contract for an ocean-going motorship of large dimensions. The vessel will be approximately the same size as the largest motor yacht afloat, the Ara. She will be 200 feet long, propelling machinery will consist of two Sulzer Diesels each of 800 brake horsepower, driving twin screws. The engines will be of the normal two-cycle type fitted with port-scavenging, and will be of the same class as the Sulzer engines installed in many vessels of the Mercantile Marine. It is estimated that the fuel consumption will not exceed eight tons per day.

Official Trials, England.—The single screw cargo steamer S. S. No. 93, built by the London & Montrose Shipbuilding & Repairing Company, Ltd., for Messrs. Llewellyn, Merritt & Price, Ltd., of Cardiff ran very satisfactory official trials; the speed obtained being a knot and a half in excess of the contract. The vessel is of the raised quarter deck type with engines placed aft and is designed to carry 1,050 tons of cargo. She has been constructed for the owners special trade and her dimensions are 189 feet by 30 feet by 14 feet 6½ inches. The propelling machinery has been built by Messrs. William Beardmore & Company, Ltd., of Coatbridge.

Motor Vessel Launched, Greenock, Scotland.—The Drechtdyk, a large awin screw motor vessel built to the order of the Holland-America Line, was successfully launched from the Greenock Yard of Harland & Wolff, Ltd. The new vessel is a high class cargo boat 485 feet by 62 feet by 38 feet 6 inches with a gross tonnage of about 9,000. The total capacity of oil fuel tanks in the vessel is about 1,200 tons. A very complete outfit of derricks and winches is fitted to ensure expeditious handling of cargo. Steering gear, windlass and refrigerating machinery are all electrically driven. The machinery, which was constructed by Harland & Wolff at their Diesel Engine Works, Glasgow, comprises two sets of 8 cylinder 4 cycle Diesel engines on the well-known Brumeister & Wain system. The engines develop a normal horsepower of 6,000 indicated, at 115 revolutions per minute.

Steamer Launched, England.—A handsomely modelled steel twin screw steamer has been launched from the Neptune Works of Swan, Hunter, & Wigam Richardson, Ltd., for the Compagnie Generale Transatlantique, Paris, intended for their mail and passenger service from Le Havre and St. Nazaire to Colon and the Pacific. The steamer is about 495

feet long by 26 feet beam by 38 feet deep and is being constructed to the highest classification in the Registry of the Bureau Veritas. There are four complete decks besides promenade deck, boat deck and navigation deck. The vessel has all the latest improvements and carries first, second and third class passengers. The twin screw machinery, supplied by the builders, consists of two sets of turbines of the "Metropolitan-Vickers Rateau" type, with double reduction gearing of the three box floating frame type, steam being supplied by eight large boilers fitted with Howden's system of forced draft and arranged to burn coal and oil. As the vessel left the ways she was named Cuba.

Launch at West Hartlepool, England.—Messrs. William Gray & Company have launched the steel single screw steamer City of Singapore, which they are building for the Hall Line of the Ellerman Lines, Ltd., Liverpool. The vessel has a length overall of 451 feet, extreme breadth 57 feet 3 inches and depth molded 32 feet 10 inches, cruiser stern, and is classed 100 A-1 at Lloyd's. The ship is fitted out to meet the owners' special requirements for the trade in which she is intended to run, and the double bottom is arranged for the carriage of oil fuel and fresh water. The equipment embodies all the latest improvements, including fresh water distiller, steam windlass, steam steering gear, electric lighting and wireless installation. Propelling machinery, made by the Central Marine Engine Works of the builders, consists of a set of triple-expansion engines with cylinders 24½ inches, 42½ inches, 74 inches diameter by 51-inch stroke, and three large boilers adapted for a working pressure of 225 pounds per square inch, and fitted with Howden's system of forced draft.

Trial Trip, England.—The trial trip of the steamer Stad Haarlem, built by Messrs. Wm. Gray and Company, Ltd., West Hartlepool, and taken over by Messrs. Halcyon-Lijn, of Rotterdam, was very successful. The dimensions of the vessel are: Length overall, 321 feet 3 inches; breadth, 46 feet 6 inches; depth molded, 26 feet 3 inches, with a deadweight carrying capacity of over 4,800 tons. The Central Marine Engine Works built the propelling machinery, which consists of triple-expansion engines, with cylinders 25 inches, 41 inches, 68 inches diameter, by 45-inch stroke, and three boilers 13 feet 4 inches diameter, by 12 feet 2 inches in length, adapted for a working pressure of 200 pounds per square inch. An oil fuel burning installation is fitted, working in conjunction with Howden's system of forced draught. A large number of "CMEW" steamship auxiliaries are fitted, including auxiliary condenser, direct contact feed heater, evaporator, feed water purifying tank, main feed, centrifugal harbor feed, ballast, fuel oil, general service, and ash ejector pumps.

New Ship, Holland.—The Nederland Shipbuilding Company of Amsterdam, has signed a contract with British owners for the building of a tanker of 280 feet in length by 46 feet 6 inches beam and 19 feet depth. The vessel will be propelled by steam engines driving twin screws.

Tug Launched, England.—Messrs. John I. Thornycroft & Company, Ltd., have launched from their Woolston shipyard a powerful tug, built and engined for the Towing Department of the Southampton, Isle of Wight, and South of England Royal Mail Steam Packet Company, Ltd.

Successful Trials, England.—The trials of the Lochgoll, a large twin screw motor vessel of 5,500 tons, built by Harland & Wolff, Ltd., at their Govan Shipyard, for the Royal Mail Steam Packet Company, proved very successful. This latest addition to the company's fleet was built under special survey, and is classed 100 A 1, at Lloyd's. She has three complete decks with poop, bridge and fore-castle, her dimensions being 502 feet by 62 feet by 38 feet 6 inches. The steering gear, windlass and the 15 cargo winches are all electrically driven, and there are 33 derricks. The vessel is propelled by two 8-cylinder 4-cycle Diesel oil engines of Harland & Wolff's standard type, on the Brumeister & Wain system. These engines develop 6,000 indicated horsepower at 115 revolutions per minute and will give a sea speed of 12½ knots.

Maiden Voyage, Germany.—The Deutsch-Australische Line cargo steamer Kiel has left Hamburg, Germany, for her maiden voyage to Central America. Her dimensions are approximately 328 feet by 47 feet by 29 feet, with a hold capacity of 3,650 tons gross. The engines are triple-expansion, of 1,800 indicated horsepower, and are designed to steam at a speed of 10.5 knots. The vessel was launched at the Germania Yard, Kiel.

Marine Engineering and Shipping Age

Volume XXVIII

February, 1923

Number 2

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY

Woolworth Building, New York

F. B. WEBSTER, Editor

H. H. BROWN, Managing Editor

L. S. BLODGETT, Associate Editor

W. Z. GARDNER, News Editor

Contributing Editors

Rear Admiral C. W. Dyson, U. S. N.

William T. Donnelly

Commander S. M. Robinson, U. S. N.

H. McL. Harding

William Gatewood

James L. Bates

Captain C. A. McAllister, U.S.C.G. (Retired)

WE GUARANTEE that of this issue, 4,850 copies were printed; that of these copies 3,807 were mailed to regular paid subscribers, 393 were provided for counter and news company sales, 196 were mailed to advertisers, 81 were mailed to employees and correspondents and 373 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 9,850, an average of 4,925 copies a month.

MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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Don't Give Up The Ships

AT about the same time that Captain Lawrence gave his famous command "Don't give up the ship" a certain general whose name is best forgotten gave the following order to the American army defending the city of Washington: "If you retreat, go by the way of Georgetown." Needless to say the army went that way allowing the British that entered the city to disgrace themselves by burning our public records and buildings.

In those days we were a maritime nation; we had more sailors on our ships than we had soldiers in the army, and every sailor was well aware when he entered an engagement that it was a case of victory, surrender or death. Did Commodore Perry have any thought of giving up when his flagship was sinking? No, not so long as a rowboat was available to take him to another vessel and to one of the most glorious naval achievements ever accomplished.

Strange as it may seem we are now in the midst of a fight upon the result of which depends the very existence of our commercial and naval power. Ignoring the teachings of all history, that a non-maritime nation cannot maintain its place, even a number of those engaged in the shipping industry are accepting what one of our esteemed contemporaries aptly calls "defeatist propaganda" and are preparing gracefully

to retreat along the road of continued Government ownership.

Under Government ownership only 386 vessels out of a total of 1,379 are in operation and thus it is costing the taxpayers \$50,000,000 annually to keep a ratio of about one in four of its vessels working. Some of our senators seem to believe that it is more desirable to keep up this tragic situation rather than allow a subsidy of from fifteen to thirty millions for the purpose of interesting private capital in taking over these ships and operating them on sound business principles.

Now is the time for every man engaged in the maritime industry to write to his senator and to let it be known to all his associates that no constructive alternative to the Administration's shipping bill has yet been proposed. Practically all of our senators want to see our merchant marine developed. They are open to argument and example and, if this is not forthcoming from shipping men, who will furnish it? Watchful waiting may be advisable in some matters but a "we have just begun to fight" policy is more in accord with our marine traditions and certainly more likely to secure the respect of our senators. As Congressman Scott of Michigan recently said, "Two things are required to secure legislation, necessity and demand." The necessity for an adequate merchant marine exists but the demand is not strong enough.

The Navy Needs Ships and Men

THE Navy needs to have a number of its capital ships modernized, it needs fast scout cruisers of the 10,000-ton type permitted by the Disarmament Conference, it needs destroyer leaders and it needs aeroplane carriers. If the people of this country are not to be deceived about the relative strength of the Navy, a constructive program should be started at once, for the 5-5-3 ratio under present conditions is nothing less than a joke.

We not only need more ships to balance the fleet as compared with other powerful navies, but we need more men. Congress allows a personnel of only 86,000 men as compared with England's 120,000. Our enlistment period is only four years as compared with twelve years in England. Our enlisted personnel is largely composed of boys who serve only one term, whereas men who have spent twelve years at sea usually remain. Almost every trade is represented on a capital ship, and the majority of the crew of these complex fighting machines should be skilled mechanics. Is it not a terrible responsibility for this country to allow a condition to arise where it might be necessary to send these ships into

battle manned by untrained men? After agreeing to scrap over \$300,000,000 worth of capital ships and fixing on a definite naval strength, why not live up to it? Other countries will never sign on the dotted line again if we don't.

Immigration Should Be Selective

INDICATIONS that there will be a shortage of labor in our large industries have awakened discussion on the possibility of revising our immigration laws. The present law limits the number of aliens that may enter this country in any one year to three percent of the number of their fellow countrymen that resided here at a particular time.

As is well known, this law has worked severe hardships not only on the steamship companies but also on the im-

any requirements as to character or mentality that we specify. Canada is basing its immigration regulations on the selective system and we would find it both practical and advantageous to follow her example.

The Passing of the Minnesota

THE *Minnesota*, the largest merchant ship ever constructed in an American shipyard, the largest vessel in deadweight carrying capacity afloat today (22,500 deadweight tons) and, at the time her keel was laid in 1901, the largest vessel either built or building in the world, is to be broken up on account of her age and lack of ability to make an economical speed. The passing of this vessel ought to be a great object lesson to every American, for when James J. Hill built the *Minnesota* and her sister ship, the *Dakota*, he probably firmly believed that the country would enact legislation granting a reasonable subsidy to American ships.

Although several attempts were made to secure Government aid at that time, they all failed but the last bill was defeated in the House of Representatives by a margin of only 3 votes. Not only this, Mr. Hill was prevented in many other ways from making these vessels a financial success in the Seattle-Orient trade. Their splendid passenger accommodations and their enormous cargo carrying capacity should have been of great value to the Great Northern Railway and the producers of the whole country, but the Interstate Commerce Commission would not allow an export rate over the railroads that would permit a fair return to the steamship line. To cite a specific instance, Mr. Hill planned to take cotton from Louisiana by rail to Seattle and then ship it to the Orient. He could have done this successfully but the Government would not allow him to charge less for the rail rate to Seattle than the domestic rate to an intermediate point.

It is well known that both Messrs. Harriman and Hill were deeply interested in promoting American steamship lines on the Pacific and it is a great tribute to Mr. Hill's vision that he started to build, over twenty years ago, practically the type of combination cargo and passenger ships that have been adopted in the post war designs of the leading English steamship companies. In fact except in the matter of speed he is still in the lead; for with the exception of a few giant passenger liners in the North Atlantic service it is recognized that the combined passenger and freight vessel is the most economical type today. Compare one of the latest Cunarders, the *Scythia*, with her gross tonnage of 18,500 and her speed of 17 knots, with the *Minnesota* whose gross tonnage is 20,602 and her designed speed 14 knots.

What a shame that the foresight of this great man was not backed up by the Government; for, if he had received any encouragement, he and others would have built more vessels and we would not have been caught in anywhere near so badly an unprepared state when the war came.

However, the past is past, we still have men of broad vision and we also have a wonderful example of what can be done by the coordination of a great railroad and steamship line. If the Canadian Pacific Railroad can operate a splendid steamship service on both the Atlantic and Pacific in connection with their railway system, why cannot we follow their



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The Goose With the Golden Eggs

—McCay in the *New York American*.

migrants themselves and has led to a condition where a few hours' difference in the time of arrival of a vessel is often the determining factor of admittance. Would it not be of far greater advantage to us to place a limitation on the quality rather than number of immigrants? Is it not the anarchist rather than the producer which we desire to exclude or have we reached the limit of the industrial expansion that has made this country great? We believe that there is still room for the class of foreigners who will make good citizens and that the cooperation of the steamship companies would be gladly offered to secure such results.

The Red Star Line, for instance, has been in business for fifty years, its agents go into every country and they know all races and every grade of society. In other words this company must know exactly who they are forwarding and further they have every means of testing the mental and physical condition of their prospective passengers at the port of embarkation. This and many other companies could easily meet

lead? By no means the least important provision in the pending shipping bill is the clause permitting the intimate co-operation of rail and water transportation. The responsibility for the future is now squarely up to the United States Senate.

Cooperation Along Atlantic Seaboard Proposed

THE New York Board of Trade and Transportation has appointed a special committee of which W. T. Donnelly is chairman for the purpose of bringing into existence a clearing house in New York for trade and transportation problems of the Atlantic Coast states. Mr. Donnelly has cruised along the seaboard in his yacht from Maine to Florida and has talked to the business men and commercial bodies in most of the seaports.

As a result of this investigation he has found that every city has its transportation problems and that they are fundamentally of the same general character. The larger and unsolved problems of these seaports are of such a nature that they can only be properly handled by a central committee of able engineers whose services can be most easily obtained in a central location like New York.

While some of the people in the Southern seaports are more or less inclined to look at any project coming from New York City with suspicion nevertheless the fact that engineering skill and transportation of their agricultural products by water highways would create a market for their fruit and vegetables such as we are now importing from South America is bound to receive favorable consideration.

Great areas of the most fertile land in the country now lie under water in these areas and they can be reclaimed so that they will produce foodstuffs cheaper and in closer proximity to cheap transportation than any other section. In fact, there is an opportunity to repeat exactly what has been done in Holland which has furnished England with cheap produce for over three hundred years.

Standardization of German Shipbuilding

THROUGH the courtesy of the Transportation Division of the Department of Commerce we are able to publish the following report of the American Consul at Hamburg, Germany, relating to the progress made in the standardization of ship parts in that country.

"Standardization of German shipbuilding began in November, 1916, when the late marine engineer Veith called a meeting with a view to establishing a Marine Standardization Commission (Marine Normen Commission). This meeting took place on November 18, 1916, at the Germania Wharf, Kiel, and was attended by the representatives of the German Navy and merchant marine. Sitzings were held periodically until the end of the war, when they were discontinued.

"The success which attended the work of this commission was an inducement to establish a similar organization to take care of the present day German merchant marine shipbuilders. This commission, known as the Handels Normen

Ausschuss, is composed of representatives of five of the most important shipping companies and by the representatives of ten of the largest shipyards.

"Up to the present time a total of 1,026 standard parts has been passed by the commission and a number of ships have been provided with parts manufactured according to its standards.

"Quite recently, the Handels Normen Ausschuss, which followed the work of the Marine Normen Commission, had



Looks like a lot of money to pay for medicine—



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But it isn't half as much as the undertaker will charge
Cheaper to Pay the Doctor Than the Undertaker

—Darling in the New York Tribune.

an exhibition in the Charlottenburg Academy showing a collection of parts which were manufactured according to the new marine standards. About 50 firms from all parts of Germany sent exhibits.

"This is the beginning of a new epoch in shipbuilding which all countries having a merchant marine may advantageously adopt, thus greatly facilitating the building and operating of ships. This is an extremely favorable economic procedure which railroad companies have long since followed and which has proved so beneficial that it is to be wondered at that the standardization of parts for ships did not spread to the shipbuilding industry in all countries a long time ago."

East Versus West on the Shipping Question

Lack of Understanding of Natural Significance of American Merchant Marine Shown in Arguments of Opponents to Subsidy Bill

By C. A. McAllister

THE writer recently published an article on the "A B C of the National Shipping Bill," in this magazine, which was subsequently reprinted in pamphlet form and given wide circulation. A copy of this was forwarded to a banking friend in Chicago, which brought forth the following reply:

"Chicago, Ill., December 20, 1922.

"My dear Captain:

"I acknowledge receipt of a reprint of your article recently published in MARINE ENGINEERING AND SHIPPING AGE entitled 'A B C of the National Shipping Bill.'

"I have read this with much interest and I congratulate you on the simple and able way in which you present this subject from your viewpoint, even though I fear I cannot agree with all of your arguments and certainly not with all of your conclusions.

"Many of us in the West, including the writer, are opposed to a national subsidy to promote American shipping, believing that this is wasteful and uneconomic in principle. I think that our opposition is chiefly based on the theory that if foreign ships can and will carry our products cheaper than we can carry them, we should permit them to do so and that there is no good reason why we should spend public money to foster an enterprise which can be more economically handled in, by or through other countries. In other words, if a United States marine can handle shipping as cheaply as foreign vessels, then there is no need for a subsidy and if they cannot handle the business as cheap as foreign vessels, it is wasteful and uneconomical in principle to attempt to engage in that line of business.

"Personally, I see no particular advantage to a United States merchant marine and we have gotten along pretty well for a good many years without anything of that kind worth speaking of. So far as future wars are concerned, it seems highly improbable that there can be any important war for many years to come, owing to the terrific exhaustion of a large part of the civilized world in the recent conflict. Moreover, it seems to me altogether probable that if there should be another great conflict in the distant future, fighting apparatus would be so changed that a merchant marine on present-day lines would be of little or no practical use.

"Your argument intimates that ship subsidies will probably be unnecessary after 10 years. I disagree on this point and believe that a subsidy will always have to be paid in order to maintain a United States merchant marine. We had a considerable merchant marine, something like a hundred years ago, without any subsidies whatever and this instead of growing, developing and increasing, gradually disappeared under adverse economic influences which still exist. These adverse influences would operate in the same way now to prevent any American merchant marine from being self-supporting, and, if subsidies were discontinued at the end of 10 years, the American merchant ships would again disappear from the ocean. The whole question seems to me to be an unwise attempt to spend the public money in defiance of economic laws.

"Referring particularly to your argument respecting the way in which the building of American ships will benefit labor, I should think it were quite apparent that we haven't sufficient labor in the country now and that there is no occasion for diverting one hundred thousand able-bodied American laboring men from other useful and productive en-

terprises into the unproductive shipbuilding business. So far as the American farmer is concerned, these men will have to be fed in any event, whether they are engaged in shipping, building or in the steel industry and the connection of their employment could have no effect on the prices of farm products.

"If a United States merchant marine cannot stand on its own foundation it ought not to exist. To support it by special subsidy is merely to waste public money which has to be raised by taxation and additional burdens in other enterprises. We have already wasted a great deal too much.

"Cordially yours,

"L. ———."

The above letter represents the opinion of a number of our prominent business men in the Middle West but the fallacy of such arguments is apparent to those who understand the importance of an American merchant marine as shown by the following reply:

My dear L.:

I have your very frank criticisms of my views on shipping legislation, and am indeed glad to receive them, as they represent in very straight-out terms a sentiment confined largely to the Middle West, but which has been, thus far, sufficiently potent to delay action on this very important bill.

OPINIONS INFLUENCED BY GEOGRAPHIC ENVIRONMENTS

In a vast country like ours differences of opinions on great economic subjects such as this, are bound to obtain, influenced largely, I think, by geographic environments, which cause us to view this and kindred subjects from entirely different viewpoints. Indeed so antipodean are the opinions of Americans on many of our economic problems that it is quite remarkable that there is concert of action on more than the most elementary principles of self-government. It probably is due solely to the underlying American trait of fairness that, as a nation, we have gotten together after full and free discussions and enacted many of our laws for the general good. That we have prospered far beyond the most sanguine dreams of the founders of the Republic, must be taken as evidence that most of our laws have been beneficial.

In making the following replies to the several criticisms which you have made, I do so merely to point out wherein our differences of viewpoints lead us, and their direct bearing on the prosperous conditions which this country has developed.

Your statement that "I think that our opposition is chiefly based on the theory that if foreign ships can and will carry our products cheaper than we can carry them, we should permit them to do so," and that "there is no good reason why we should spend Public money to foster an enterprise which can be more economically handled in, through or by other countries" is one that is really the heart of the entire controversy between East and West.

FALLACY OF ALLOWING FOREIGN SHIPS TO CARRY OUR PRODUCTS BECAUSE THEY CAN DO IT CHEAPER

This argument is certainly not new as it has been raised against every new industry in which this country has ever embarked. Fortunately for all concerned it has but seldom prevailed.

If it had been carried out logically from the beginning

of our national life, we would today be a nation of producers of raw materials, with just sufficient mercantile and banking interests to carry on the exchange of these raw materials for the manufactured articles of Europe. For example iron and steel are the great basic materials on which our predominance as a manufacturing country depends. In the early days we could not produce iron or steel goods of as good quality or anywhere nearly so cheaply as we could purchase them abroad and have them delivered at our very doors. Our English cousins were quite willing and anxious to make all our iron products for us, and even went so far as to tell us that it was "wasteful and uneconomic" for us to embark in that enterprise which they could do for us so much cheaper.

THE CASE OF TEXTILES

In the great cotton industry they welcomed the raw product, which the fertile soil of our Southland produced so lavishly, but our early New Englanders, while familiar with spinning jennies, should never go into the manufacture of textiles because the mills of Manchester could do it so much better and cheaper than they.

In our own generation we have seen the great advances made in the manufacture of woollens in this country. Why should we have ventured into that industry at all? English mills made splendid cloth, and sold it to us much cheaper than we could produce it here. We also have seen the rise of the tinware industry in this country. As boys we remember when all such was imported from Great Britain. Why should we not have continued to buy it abroad? They made it cheaper than we could here, and cheaper even now than we can make it. Apply the same reasoning to any one of our great manufacturing industries in this country and you will find that almost without exception none has been built up without being fostered by our Government through the medium of the protective tariff.

SUBSIDY SERVES AS PROTECTIVE TARIFF

Now this proposed payment to shipowners, popularly known as a "subsidy," is nothing more nor less than a protective tariff to shipping; as it is the only industry in this country today which does not have protection of some sort why single out this oldest of all industries, as the only one which must alone and unaided wrestle with our old friend "economic conditions"?

So much for the fairness of the proposition, let us now look at the subject as a matter of self interest to the nation, and consider your statement that "I see no particular advantage to a United States merchant marine."

Your great city of Chicago has been built up from a trading post where the farmers of the vicinity swapped their raw materials for the clothing, furniture, hardware, etc., necessary for their existence, which had been brought by ships from European manufacturers, into one of the greatest manufacturing centers of the world, largely through the benefits of the protective tariff, and through its contiguity to the products of farm and mine. You are prosperous just now, because the United States is prosperous and consumes the bulk of your manufactured output, the remainder going to devastated countries in Europe, where the demand is strong and the buying power weak. If the home markets could take all your output, all well and good, as your only need for shipping would then be the modern prairie schooner running on steel rails.

But Germany and Russia are not going to remain out of the economic picture all the time, and when they get back to producing and trading, Chicago and the Middle West will not find such easy world markets for their excess products of the farm and factory. Germany showed quite conclusively that by her cheap manufacturing and owning her own merchant ships she was very rapidly assuming mastery of the world's commerce, before her militaristic leaders led her

into national hara-kiri. Her commercial supremacy was, as every one knows, built up almost coincidentally with and principally due to the upbuilding of her merchant marine.

COMPETITION IN FOREIGN MARKETS

When world conditions grow normal, as they must, we will have at least a surplusage of fifteen percent of farm and manufactured products, which we will have to sell in competitive markets abroad. In spite of your dictum that the ship which will carry our exports the cheapest should get the business, you know full well that the oft pronounced adage that "you cannot sell your products from the other fellow's delivery wagons," applies just as forcibly to our world trade, as it does to small town rivals in merchandise. Human nature prevails throughout all our undertakings, no matter on how large a scale transacted. You cannot expect an English or a German ship to carry goods manufactured in Chicago to a competitive market in South America for example, and not give preference in the many ways known to ship operators, to similar goods manufactured in their own countries which are in the competition. To illustrate, I must quote an incident which actually occurred in one of the leading ports of South America.

A large railroad contemplated the purchase of thirty locomotives, and invited bids from builders in the United States, England and France. An English attaché of the consulate, and they are always on the alert, persuaded the purchasers to change the proposals from f. o. b. nearest seaport to c. i. f. The bids when received were so close between American and British builders, that the decision was made on the difference in the cost of the freight. It happened that the same British steamship line served both Liverpool and New York from this South American port, and, although New York was actually 500 miles nearer the point of destination, the American locomotive builders were quoted higher rates than the English builders. This resulted in a contract involving over half a million dollars being given to Great Britain instead of to us. Oh! yes! Let the "cheapest" carrier do our business for us.

Again, it is a well known fact that British ships carrying our cotton to their own ports have actually carried their manufactured articles on the return trips to what should be our natural market, ports in the West Indies, at a lower rate, than they could be carried in "foreign ships" from Boston and New York. How could they do that, I hear you ask? Very simple, they "stung" our Southern cotton growers a sufficient excess in freight on their home-bound voyages to make the round trip profitable. Yet the Southern representatives in Congress are joining you people in the Middle West in damning anything which helps an American merchant marine.

Once more, "let the cheapest carrier do our business."

IMPORTANCE OF A MERCHANT MARINE TO THE NATION

In the arguments which you and the other opponents of American shipping put up, you overlook the great underlying fact that a merchant marine must be national, just as much as the Army and Navy. There are certain functions in life, which we as individuals, families, cities, states or as a nation must do for ourselves; things which we cannot hire done by others, even though performed cheaper. Now I haven't a doubt in the world but what we could replace all the officers and men in our Army and Navy by officers and men from Germany or Japan, and have both these great services run "cheaper" than they are now. I also have no doubt, but that the city of Chicago could go out to India for example, and employ big, lunky natives to serve you as policemen and firemen, for less than half the present cost to Chicago taxpayers of your present efficient forces.

On your principle of having the merchant marine "more

economically handled in, by or through other countries," just begin at home by applying that principle in the direction I have suggested, and see what would happen. The "economy" would be there, but, Oh Boy, what a ruction would be raised! You see these grand and glittering economic generalities do not work so well, when generally applied. Therefore, to use the language of the day "Why pick on us?" Why pick on an industry which has built up all the great nations in history, because shipping is most decidedly a *national* institution.

UNJUSTIFIED OPTIMISM

Referring to your optimism regarding the improbability of any important war for many years to come, and hence no necessity of a merchant marine for military purposes, I must say that I devotedly join with you in your *hopes* along that line. Just as I am writing this, however, I note that a vast French army is marching into Germany. Evidently the dove of peace in that locality is getting his, her or its feathers scorched.

It was just such optimism as you express, and which was enunciated by millions of our countrymen, which led us to neglect our merchant marine for over half a century. The net result is that you and I and all our fellow long suffering taxpayers will be digging down in our threadbare jeans for the next fifty years or more, to pay our portion of the annual interest on about three billions of Liberty Bonds, being the amount we very feverishly expended to build up our merchant marine in two years' time, to meet the conditions thrust upon us in a World War, which optimists thought would never come upon us.

I am just as far from being a militarist as are you, and I cannot conceive of anything being more wasteful, uneconomical and suicidal than this continued wrangling between nations, with resultant squandering of money for military purposes. But I am old enough to have observed that human characteristics have not changed appreciably in my lifetime, and show no evidences of even changing for the better. So long as individuals will quarrel and fight, what can we expect of nations composed of individuals possessing and governed by fundamental human traits. Under such conditions the best we can do is to prepare for the worst that can happen, and feel quite sure that our very preparedness will do more to obviate armed conflict than any other precautions we can take.

MERCHANT SHIPS WILL BE NEEDED FOR FUTURE WARFARE

As to your surmise that future warfare, if it should occur, would be conducted with such new apparatus as to preclude the use of a merchant marine, let me suggest that mankind has not yet mastered the art of walking on the water to any considerable extent. If the scene of future hostilities is transferred to the air, as I firmly believe will happen, supplies and men will still have to be transported over the seas in merchant ships and transports. I cannot conceive of any kind of warfare being carried on, where the use of ships on the surface of the seas will not be necessary. Ships capable of going to sea in all kinds of weather cannot be improvised nor purchased from other nations after hostilities have commenced. If we are again caught without sufficient merchant shipping as we were during the recent war, our penalties may be far greater than those from which we are now suffering, in the form of our great national debt. We too may be confronted with reparations in addition to our own debts, as it is quite conceivable that the next time we will not have self-interested allies to make up our deficiencies on the seas.

If you will read President Harding's able message on our present shipping status, it will be very plainly proven to you that the passage of the pending bill will actually decrease our present taxation instead of increasing it, as is

popularly supposed by those who have given the subject only superficial study.

Thanking you for the attention you have given my brief on the subject, and the opportunity of making this reply, I am,

Cordially yours,

C. A. McALLISTER.

Diesel-Engined Combination Lighter and Towboat Ordered

A CONTRACT has recently been awarded by the Cuban-American Sugar Company to the Vinyard Shipbuilding Company, Milford, Del., for a combination lighter and towboat, designed by Cox & Stevens, naval architects, New York, who will also superintend the construction of the vessel.

The boat, which will be equipped with a Diesel motor, is of wooden construction of the following dimensions:

Length overall	90 feet, 0 inches
Length on waterline	85 feet, 6 inches
Breadth molded	22 feet, 0 inches
Depth (top of keel to top of deck beam at side) ..	10 feet, 10 inches
Draft	8 feet, 0 inches

The boat is of the conventional lighter type, with machinery aft, derrick mast and boom at the forward end of the house, and a cargo hold forward, as well as stowage for deck freight. The scantlings of the hull are in accordance with best practice for vessels of this type. Particular attention has been paid to fastening the hull so as to secure rigid construction, the planking having square fastenings with two locust treenails and two galvanized iron spikes to each frame crossing.

Water tanks of galvanized iron construction of 500 gallons capacity are provided under the after deck, and fuel oil tanks of three tons capacity, lubricating oil tanks of 120 gallons capacity, as well as tankage for kerosene and gasoline are provided, all of steel construction except the gasoline tank which will be of copper.

The machinery equipment consists of the main engine of the Winton Diesel reversible type, to deliver 225 brake horsepower, with air compressor, fuel oil service and transfer pumps, and all the necessary equipment for complete installation. Electric lighting will be supplied by a 5 kilowatt Winton generator set, using kerosene as fuel. There will be a hoisting engine, oil engine driven. Steering will be by hand from the pilot house.

In the house on the main deck there will be forward of the machinery enclosure a double-bedded stateroom, on the port side of the engine room enclosure another stateroom with two berths, opposite which on the starboard side is a toilet and a stateroom. Aft of the machinery space and in the same house on the port side is a galley, fully equipped, and on the starboard side a mess room for the crew.

On top of the deckhouse between the funnel and the mast is a pilot house with a berth for the captain.

The after deck is left clear for towing purposes and is fitted with heavy towing bitts. A cargo winch is placed aft of the mast, the upper deck being carried over at this point to afford protection from the weather. The whole deck forward of the house is left clear for the stowage of cargo. Forward on the centerline is a heavy pair of bitts of the regular towboat type, and all the necessary and usual chocks and cleats and deck fittings are included in the specifications.

It is interesting to note that on this small craft it will be possible, even when water and fuel tanks are full, to carry approximately 100 tons of cargo. This would have been an impossibility on the given dimensions had steam machinery been employed for an equivalent steaming radius.

Effect of Stevedoring Costs on Operating Expenses

By Lawrence B. Chapman*

Discussion based on theoretical ships, ideal trade conditions and certain assumed data showing what gains in profits may be expected by reduction in stevedoring rates and quicker turn-arounds.

TODAY a great deal of attention is being directed to the handicap of American ships because of the greater first costs and higher wages and subsistence costs of American crews. Fuel costs, engine-room economy and the advantages of the motorship are also receiving much attention. While all of these are important in the building up of an efficient merchant marine in competition with other nations, yet it is interesting to note that practically no attention is being directed at the problem of cargo handling and turn-around. It is obvious to even the casual observer that most of the methods used today in handling cargo at American ports are very inefficient and slow. The problem of handling of ship's cargoes is intimately connected with the layout and operation of marine terminals and piers and one should not be studied without attention to the other. However, it is my intention to take up at this time only one phase of the problem, namely, the loading and unloading of the cargo at the ship.

COSTS OF LOADING AND UNLOADING CARGO

The costs of loading the cargo from the pier to the ship's hold and discharging the cargo from the ship to the pier rightly belong to the operating charges of the ship; while the handling of the cargo to and from the transit shed, sorting, tiering, etc., should be charged against the cargo and not against the ship. To show the effect on operating expenses of cargo handling and turn-around the following example is given. This example assumes ideal conditions and speeds of cargo handling beyond present day practice. It is presented to illustrate how variations in the speed and cost of handling cargo affect the annual profits.

MAIN PARTICULARS OF VESSEL

Length between perpendiculars.....	420 feet
Beam	60 feet
Draft	26 feet

*Head of the Course in Ship Construction and Marine Transportation, Lehigh University, Bethlehem, Pa.

Depth	35 feet, 6 inches
Displacement	14,600 tons
Gross deadweight	10,000 tons
Net cargo deadweight for 5,000 miles.....	9,050 tons
Net tonnage	4,750
Sea Speed	11½ knots
Shaft horsepower	2,980
Gearred turbines; watertube boilers; fuel oil; cargo carried per voyage.....	75 percent of net cargo deadweight
Initial cost of ship.....	\$1,000,000

Table I gives the data and annual operating expenses for the above ship for four different conditions of cargo handling. The data for ship No. 1 is taken with a slight modification in fuel cost from an article by the author in the January issue of MARINE ENGINEERING AND SHIPPING AGE. The reader is referred to that issue for a full explanation and method of computing the data.

In computing the expenses shown in Table I it was assumed that 5 hatches were in operation for 10 hours per day and that each hatch was handling 30 tons of cargo per hour—a rate very much higher than the average today.

RATE OF STEVEDORING

Observations by the author at the Port of Boston over a period of two months covering a large number of ships with a great variety of cargo, brought out the fact that the average speed of handling cargo was about 20 tons per hatch per hour with about 25 tons per hour as a maximum. These observations also showed that in most cases only three hatches were being worked at one time. This would give a rate for the ten hour day of 20 x 3 x 10 = 600 tons per day instead of 1,500 tons per day allowed in Table I for ship No. 1.

The writer has observed many cases where the rate has been as high as 32 tons per hatch per hour for short periods. In one case where sugar was being unloaded the rate averaged nearly 70 tons per hatch per hour for a long period. The rates used in Table I have purposely been chosen in

TABLE I.—DATA FOR VOYAGE OF 5,000 MILES

	No. 1	No. 2	No. 3	No. 4
1. Rate of stevedoring (tons per hatch per hour).....	30	20	30	30
2. Hatches being worked.....	5	3	5	5
3. Rate of stevedoring per 10 hour day (tons).....	1,500	750	1,500	1,500
4. Cost of stevedoring per ton handled.....	\$.70	\$.70	\$ 1.40	\$.35
5. Calculated days on the run + 5 percent.....	19	19	19	19
6. Calculated days in port + 10 percent.....	10	20	10	10
7. Days per single trip.....	29	39	29	29
8. Single trips per year.....	11.53	8.60	11.53	11.53
9. Tons carried per year at 75 percent capacity.....	78,300	58,300	78,300	78,300
Annual expenses:				
10. Depreciation (5 percent).....	\$50,000	\$50,000	\$50,000	\$50,000
11. Insurance on hull and machinery (5 percent).....	50,000	50,000	50,000	50,000
12. Repairs, maintenance and overhauling (5 percent).....	50,000	50,000	50,000	50,000
13. Fuel used at sea and in port at \$1.25 per barrel.....	72,500	59,000	72,500	72,500
14. Lubricating oil and fresh water.....	3,000	3,000	3,000	3,000
15. Wages of crew.....	37,500	37,500	37,500	37,500
16. Subsistence	8,500	8,500	8,500	8,500
17. Tonnage dues and port charges.....	34,500	39,500	34,500	34,500
18. Brokerage and management.....	39,000	29,000	39,000	39,000
19. Stevedoring	110,000	81,500	220,000	55,000
20. Annual operating expenses.....	455,000	408,000	565,000	400,000
21. Receipts from cargo at \$7.50 a ton.....	586,000	438,000	586,000	586,000
22. Annual profit (Line 21—Line 20).....	131,000	30,000	21,000	186,000
23. Percent return on investment.....	13.1	3	2.1	18.6

excess of rates used today to show the effect of quick turn-arounds on profits and freight rates.

Anderson in his paper "The Most Suitable Sizes and Speeds for General Cargo Steamers" before the Institution of Naval Architects in 1918 proposed rates for a ship of this size of 36 tons per hatch per hour. He assumed 6 hatches in operation for 10 hours giving 2,160 tons per day as an ideal condition of cargo handling.

BASIC COST OF HANDLING CARGO

The basic cost of handling cargo has been taken as 70 cents per ton and calculations have been carried through for rates of one-half and double this basic rate. Two rates of cargo handling are given, namely, 1,500 tons per day and 750 tons per day.

Table I shows the total annual operating expenses and profits for a freight rate of \$7.50 per year for four different conditions. The data in this table bring out some interesting facts.

DAYS SPENT IN PORT PER VOYAGE

Line 6 shows the days spent in port per voyage discharging and receiving cargo. This time is directly affected by the rate of stevedoring. The result of reducing this rate for ship No. 2 doubles the number of days spent in port and reduces the number of trips per year. This in turn reduces the income from cargo (line 21) and the annual profit (line 23).

For ships Nos. 3 and 4, when the rate of handling cargo remains the same as for ship No. 1, the only item changed is the cost of stevedoring (line 19). The effect of this on the profits is shown in line 23.

The capital charges, which are 15 percent of the investment, continue whether the ship is in port or at sea. As the ship is built primarily to carry cargo between two points, its efficiency should be measured by the percentage of the total time that is spent at sea. For the ship in question, the capital charges amount to \$410 per day. If the ship is idle, this item is a dead loss, for the ship is not earning profits while in port.

The calculated time in port for cargo handling has been increased 10 percent to allow for tides, holidays, etc., and the calculated time at sea has been increased 5 percent to allow for bad weather. Thirty days per year have been allowed for annual overhauling. The crew's wages are based on the Shipping Board's scale effective April, 1922. Fuel oil has been assumed at \$1.25 per barrel and 8 pounds per gallon, lubricating oil at 75 cents a gallon and feed water at \$1 a ton. Port fuel for heating, lighting and operating the winches is 7 tons per day. Port charges include tonnage dues, pilotage, towage, miscellaneous fees, cooperage, dunnage, watchmen's and clerks' wages and wharfage.

VARIABLE FACTORS AFFECTING STEVEDORING COSTS

The data presented in the tables are for a voyage of 5,000 miles and the stevedoring costs naturally vary with the length of voyage. For this same ship on a voyage of 10,000 miles the number of trips per year becomes 7.15 and the cargo carried per year reduces to 43,000 tons. Thus on the long voyage the stevedoring costs are reduced because of the smaller number of tons handled per year. For ship No. 1 the stevedoring charges reduce from 24 to 15 percent of the total operating expenses for the 10,000 mile voyage.

Conversely, the shorter the voyage the greater are the relative charges for stevedoring, becoming an extremely large proportion of the operating expenses of the vessel on the very short route.

The cargo handling charges also change with the size of the ship but according to no definite law; hence an example should be worked up to give a reliable comparison.

Table II shows the above expenses arranged as percent-

ages of the annual operating expenses. This table shows clearly the importance of the various annual expenses.

Capital charges, which are fixed by the first cost of the ship and the cost of repairs and overhauling, is the largest item, being about $\frac{1}{3}$ of the total expense of operation.

Stevedoring of the cargo is the next largest item and averages about $\frac{1}{5}$ of the annual outlay for operation.

TABLE II.—OPERATING EXPENSES ARRANGED AS PERCENTAGES

	1	2	3	4
1. Capital charges	33.0	36.7	26.5	37.6
2. Fuel, lubricating oil and water.....	16.6	15.2	13.4	18.8
3. Brokerage and management	8.6	7.1	6.9	9.8
4. Crew and subsistence	10.0	11.3	8.1	11.5
5. Port charges	7.6	9.7	6.1	8.6
6. Stevedoring	24.2	20.0	39.0	13.7
Total operating expenses	100	100	100	100

Observations made by the writer lead him to believe that present day methods of cargo handling can be greatly improved upon. The most important factor of course is labor and at present the shipowner is more or less at the mercy of the stevedores. Yet, if the union stevedore can handle sugar at the rate of 70 tons per hatch per hour at 40 cents per ton, why should a shipowner pay \$1.50 per ton for general cargo and tolerate a speed of 18 tons per hatch per hour?

The size of the draft today averages about $\frac{1}{2}$ ton which is about the best that can be handled without becoming too bulky and unwieldy. The number of drafts per minute, however, is very low, averaging in most cases between $1\frac{1}{2}$ to 2 minutes per draft. If a rate of 1 draft per minute could be maintained, the 30 ton rate per hatch would be possible and with $1\frac{1}{3}$ drafts per minute 40 tons per hatch could be maintained.

METHODS OF HANDLING CARGO

The following systems and methods of handling cargo are in use today:

- (1) Swinging boom (one boom, one winchman, one hook).
- (2) Burtoning by yardarm method (2 booms, 1 or 2 winchmen, one hook).
- (3) Burtoning with 2 hooks (2 booms, 2 winchmen, 2 hooks).
- (4) Pier crane in combination with one ship boom.
- (5) Conveyors.
- (6) Conveyors in combination with any of the above.

Any of the above systems may be used in combination with the skid, if the marginal way between the ship and the pier shed is too narrow. For any of the systems to work efficiently, however, there should be a marginal way about 35 feet wide between the ship and the transit shed. The necessity for this will be clearly shown later on.

(1) The swinging boom, although still used to a considerable extent, is far too slow and antiquated to receive any consideration.

(2) In the burtoning system, where only one hook is used, one boom is stayed over the hatch and another over the ship's side. The draft of cargo makes a continuous movement from ship to pier. Generally two men are employed to operate the winches, one slacking off while the other hoists. Frequently one man can manipulate both winches, thereby saving the cost of one man. In the hands of skillful stevedores and with proper equipment, good speed can be maintained with this system.

BURTONING WITH TWO HOISTS OFFERS BEST POSSIBILITIES

(3) The method of burtoning by the use of two hoists, however, offers the best possibilities for speed and efficiency. In this system one boom and hoist handles the cargo from the hold to the deck and the second from the deck to the pier or vice versa.

Today, the method of operating this latter system is often

very inefficient. In unloading, the draft from the hold is frequently not placed on deck until the one previously placed there has been removed and the draft to the pier is held suspended until stevedores arrive to take it. Used in this way the system is very slow and the real advantages of it are lost.

Properly used the system should have two reservoir piles, one on deck and one on the pier so that delays at one hook will not cause a delay all along the line. Thus, if each hoist works independently of the other, several drafts will be accumulated on deck and several on the pier. With this arrangement any accident or delay at the hatch boom will not cause a delay at the wharf boom or among the stevedores on the pier. The accumulated drafts on deck will act as a reservoir supply for the wharf boom until the hatch boom is again in operation. Similarly, if an accident stops the wharf boom, the stevedores have a reservoir pile on the pier to draw from. By the use of this reservoir principle a continuous stream of cargo can be maintained from ship to pier or from pier to ship and, with a sufficient number of stevedores, between 30 and 40 tons per hatch can be maintained.

Ordinarily this system is much faster than the yardarm system, which uses one hook, because the reservoir principle is lacking with the latter. However, when uniform cargo carriers are used which can be placed directly on electric or trailer trucks and when there are plenty of trucks and carriers available so that there is absolutely no waiting for a draft in the hold or on the pier, the speed of this system can often be made equal to, if not better than, the two hook system.

(4) The pier crane while capable of handling heavy drafts is at a disadvantage because of its speed. Ordinarily

a draft of much over a ton becomes too bulky to handle; so a crane of large capacity is of no advantage for general cargo. If used in conjunction with one ship's hook, the pier crane can handle two drafts at one swing. It is of particular advantage when handling cargo to or from an upper deck of a pier. However, the pier crane offers no advantage over ship's booms and except for two deck transit sheds or for special heavy pieces is not to be recommended.

Conveyors have not been used to much extent in handling cargoes to or from ships. For standard package cargo there is no reason why conveyors from ship to pier and conveyor hoists from hold to deck should not show better speed and labor costs much below any of the other systems.

WIDE MARGINAL WAY SHOULD BE PROVIDED

No matter which system is used a marginal way about 33 feet wide should be allowed between the ship and the transit shed. This allows plenty of space for the pier reservoir and results in much saving of time both in receiving and discharging cargo. Comparatively few American piers have this marginal way and hence the skid must be used which causes untold delay and confusion on the pier.

In stowing cargo the draft should be unfastened from the hook as soon as it has been placed in the hold. Frequently long delays take place in the hold because the hold gang attempt to stow each draft while it is still fast to the hoist. The hold gang and the pier gang should be of sufficient size to keep pace with the ship's tackle.

Although the foregoing discussion is based on theoretical ships, ideal trade conditions and certain assumed data, it shows clearly the gains in profits that may be expected by a reduction in stevedoring rates and quicker turn-arounds.

Steamship America Saves 1,400 Tons of Coal in Three Voyages

LAST fall, considerable comment was made in marine circles regarding the performance of the S.S. *America*, operated by the United States Lines for the United States Shipping Board.

This vessel had been selected by the Fuel Conservation Committee, which is composed of Captain C. A. McAllister, Commander R. D. Gatewood, Colonel George Bartlett, Major George M. Talbot, Maurice Healey, E. A. Peabody, D. M. Myers, H. B. Taylor, F. B. Webster, C. J. Jefferson, E. A. Stevens, C. H. Jack, as an example of what could be done to increase the efficiency of operation of some of the vessels of the American merchant marine. The port staff of the United States Lines and the engineer personnel of the vessel co-operated heartily in the program.

The results of the first voyage were made public and showed remarkable saving. However, there was considerable skepticism as to whether or not this saving would continue. On December 9, the *America* completed her third voyage since the furnace fittings had been modified and the total fuel savings for the three voyages now totals 1,400 tons, the vessel operating with the same speed and draft conditions as she had previous to the changes.

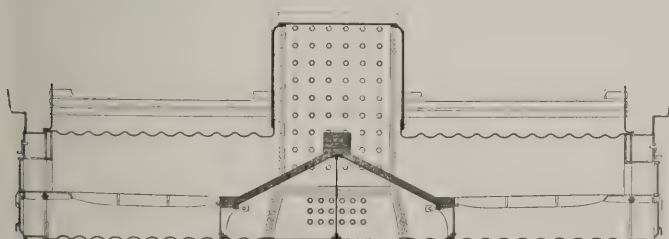


Fig. 1.—Former Arrangement of Grates and Bridge Walls as Installed by the Germans

Fig. 1 shows the condition of the furnaces as they were previous to the changes. This is a typical installation used on all the double-ended boilers of the ex-German ships by the Germans. It will be noted that the combustion chamber has practically 30 percent of its volume cut out by the brick division wall and the long sloping brick bridge wall. The grate surface in this case was 6 feet 3 inches long and it was practically impossible for the firemen to work the rear end of the fires.

Fig. 2 shows the furnaces as they now are. The combustion chamber has been cleared of all brick work and now affords a reasonable volume in which the gases can complete their combustion. The grate bars have been shortened 9 inches so that the entire fire can be worked.

The cumbersome long sloping brick bridge walls have been replaced with a cast iron ventilated type of bridge wall which permits sufficient air to enter the rear end of the fire to complete combustion and to eliminate the troubles arising from large clinkers growing at the bridge wall.

By carrying out the principles of good fire room practice, that is, keeping the ash pits cleaned out and the opening between grate bars and between the sections of the bridge wall free of slag or ash, the operating personnel has kept this equipment in its original condition and no maintenance charges have been necessary up to date.

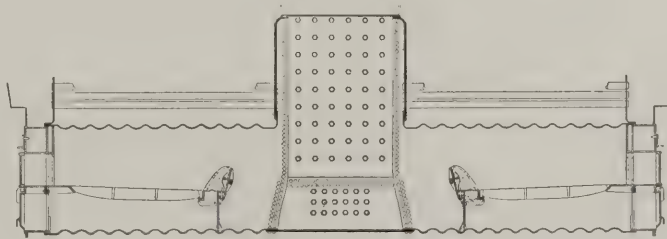


Fig. 2.—Improved Arrangement of Grates and Bridge Walls Made By Shipping Board Fuel Conservation Committee

Curious Incidents in the Careers of Hoodoo Ships

Of All Superstitions the Commonest and Best Justified Is the Belief That Some Ships Are Accursed

By Robert E. Annin

THE moving incidents of deep sea experience will always have an interest and charm, even for those whose daily occupation would tend to make them commonplace. It was by his fetching narratives that Othello induced Desdemona to waive the color line and the financial uncertainties of seaborne security are the theme of parts of the "Merchant of Venice." Certainly, unless a man is almost devoid of nerves, the anxieties of a fleet are likely to give him many nights of broken slumbers, and a feeling of trepidation as he opens the morning radiograms. From the constant strain always inherent in the business, have arisen the superstitions for which sailors as a class have been notorious, and from whom they have spread to the shore workers and offices.

In old times, for example, an owner would not sail his ship on Friday, if it could be avoided; and the average sailor would not sign on a ship booked to sail on the sixth day of the week.

But with the absolute necessity of quick turnaround on large and expensive ships the "Friday superstition" has long been falling into disuse, and steamers sail as soon as ready, wasting neither time nor money on unreasonable prejudices. The result of this has been the exploding of this particular notion, despite the "guaranteed" story of the English owner who had his ship's keel laid, ship launched, and sailed on Friday. She was named the *Friday* and was intended to break up the "Friday" idea, but she was never heard of after leaving port on her maiden voyage.

Of the superstitions which remain, the commonest, and probably the best justified, is the belief that some ships are accursed (as it used to be phrased) or, in modern vernacular, "hoodooed." Any underwriter of experience will admit that there are ships on which he will not accept any portion of the risk, although they may meet all required conditions as to construction, equipment, supply and personnel. But careful insurers refuse them simply on their record. It is impossible to say what makes a ship "unlucky," but there are vessels which no experience, foresight, care or expense seem to be able to keep out of trouble. Such ships are a sorrow to owners, a terror to operators and a thorn in the side of underwriters.

The "hoodoo" ship meets only the chances and incurs only the perils which threaten her more fortunate sisters—Acts of God, negligence, incapacity and dishonesty. But what really marks her as a "hoodoo" is that one or the other of these roots of bitterness is at work on her all the time. Hence neither ship nor owners ever get a fair chance to "rest up," physically or financially. Any ship is liable to have an occasional incompetent in command; but the hoodoo ship always has him on the hard voyage and in the emergency. Any ship may have dishonest agents and officers; the hoodoo ship has them both at the same time, working together in a distant port, where the owner will never know what is going on until too late. Ordinary ships have their hard luck spots, and get over them. The "hoodoo" distributes her misfortune economically, so as to have at least one in reserve for each new voyage.

One final peculiarity of the real hoodoo is that she never becomes a total loss. She may be stranded, sunk, burned or in collision, but there is always too much of her left to abandon. Thus she is repeatedly repaired, at an expense which fresh misfortune is likely to render useless, until age, the Act

of God or the disgust of owners put her out of business. Her cargoes may be damaged, her officers wiped out, her crew swept away by pestilence, but the ship always turns up ready and anxious for more repairs. She repeatedly meets conditions which would destroy any ordinary vessel of her class; but whoever may be hurt or killed, she is always saved to gladden the heart of the drydock. Hence the time which the ordinary vessel uses to earn expenses and income is put in by the hoodoo in trying to pay for dead horses.

THE ST. PAUL

An example of the bad combinations that strike unlucky ships may be found in the sinking of the steamer *St. Paul* in New York harbor on April 25, 1918. The vessel had been drydocked in Brooklyn and was being towed to her North River pier when she listed heavily, turned on her side and sank. Investigation showed that an ash port on her port side had been left open. This would have done no harm had her ballast been well distributed, nor even then had the ship remained on a fairly even keel during her short tow from dock to pier. But there was a good deal of wind and a swift spring tide. As the ship, rather cranky at best, met the wind and turned to cross the tide, she listed so as to put her ash port under, and the foundering followed in due course. It takes a pretty unlucky ship to have a spring tide, a head wind, and badly trimmed ballast combine with a careless seaman to sink her. And it should be remembered that had the seaman left open a port on the starboard side no harm would have ensued.

The *St. Paul*, however, had quite a record of misfortune for a passenger ship of her class. After sticking on the ways at her launching she had a rather hectic career, but the chief incidents were her sinking of the British warship *Gladiator* in 1908 and sinking herself in 1918.

A sample voyage of another unlucky steamer probably established a record in the matter of towages and ports of refuge on a transatlantic trip. She carried coal from Charleston, S. C., to Nantes in 1921. She put in at the Azores, was picked up helpless in the Bay of Biscay and towed to point St. Mathieu. Thence she proceeded to Brest for repairs and proceeded up the river for Nantes and grounded; was pulled off and towed to Nantes, repaired and sailed for home. She made port at Brest for repairs; put in at Azores for water; sailed thence for New York; was picked up 1,000 miles east of Sandy Hook and towed to Scotland light, where she was left to proceed under her own steam to quarantine. She made Gravesend Bay as her last port of refuge, anchored and whistled for a towboat. Instead of the fifty days estimated for the round trip, this ship took four months. The profits may be easily imagined. But this was not all "hoodoo." She had just undergone extensive and expensive repairs under Government supervision, and had been inspected and certified as ready for sea in hull, engines and equipment. One would like to ask who "certified" her and what he got for it.

A REAL HARD-LUCK SHIP

For the case of a genuine "Jonah" ship a part of the record of a large American schooner almost transcends belief. It should be stated for reasons obvious to those familiar with wartime construction that she was well built some years be-

fore the war, by an excellent builder, and there was no apparent reason why she should not do at least as well as the average of her type.

In the spring of 1917 this vessel arrived at Port Natal with a cargo of lumber from "The States." She loaded a cargo for New York and sailed. Two days out, she was struck by a hurricane, suffering some damage and losing many of her sails. It was deemed wise to return to Port Natal and repair damages. She did so and a week later sailed again. Three hundred miles out she was struck by a gale, lost many sails and her anchor chains came down on her sea cock, breaking it and threatening to flood the hold. Pumps were set to work and a steamer hailed, which put out a line and started to tow. After breaking three tow lines the steamer resigned the contract and the schooner limped into port under canvas. Survey was held with the result that the ship was ordered discharged and docked; sails were ordered by cable, to come per steamer from New York. This was in mid-July, 1917. At this stage the master decided that he had had enough and resigned, turning over the command to the chief mate. The ship waited her turn at drydock until mid-September, when work was started. It was November before she was reladen and ready for sea.

The next that was heard of her she had taken refuge within the Delaware Capes, loaded with ice, running rigging frozen and crew ready to mutiny. This was early February, 1918, so that, evidently, in addition to being no Mascotte, she was no ocean greyhound. She was towed up the coast to New York and, since the topmasts were not struck before passing up the East River, she hit the Brooklyn Bridge and carried them away. She discharged a pretty good cargo (considering) and was sent to drydock for \$15,000 worth of repairs (March, 1918). She waited six weeks for her turn at the dock; the repairs lasted until late July and cost \$60,000.

In August, 1918, she loaded for Buenos Aires. Sailing for that port she collided with her towboat in Ambrose channel, breaking four planks, and returned for four days' repairs. Again she encountered a cyclone in the Caribbean, lost her deckload, sustained heavy damages and limped into Buenos Aires in December a partial wreck. At Buenos Aires she discharged and refitted. Cargo was damaged, and the seeds of several suits planted. The expense bill was about \$40,000. She then took on a cargo of wheat for the Mediterranean and sailed; off Rio Janeiro she was found to be leaking and as the pumps were choked with wheat she put in Rio as port of refuge, making four general averages and four ports of refuge in twenty months. She sailed in April, 1919, for the Mediterranean, and in July put into the Azores, short of provisions, water and money. Finally she arrived at her discharging port in early September, having taken a year for the voyage from New York via Buenos Aires. While discharging she caught fire, but was not much damaged.

To follow in detail the history of this ship would only create incredulity. Her actual record of disaster transcends any hard luck story of Kipling or Jacobs or Clark Russell. The main incidents of the next two years are therefore merely summarized.

In September, 1920, she was partially destroyed by fire while in drydock. In October of the same year she went ashore on the Atlantic coast twice within forty-eight hours. In December she grounded in a southern port and, proceeding to sea, developed such openings of her seams that her pumps could not clear her. She was towed up a southern river and anchored over a (supposed) mud flat. When the tide went out she was found aground on an uncharted sunken rock, which almost broke her in two. In 1921 she encountered a cyclone and was towed into an Atlantic port, drydocked and fell off the blocks as the water receded. Early in 1922 she sailed from New York for the south Atlantic coast of the United States, but put back three weeks later and struck on an unknown rock in Newtown Creek.

It may be added that this schooner was launched on a Friday and stuck on the ways in launching. (This the writer understands to be a fact and not a bit of belated jocosity.)

An analysis of the three years of disaster (so far as details are available) would show that of the vessel's misfortunes about 20 percent were due to misjudgment or negligence; 30 percent to "Acts of God"; and the remaining 50 percent to an unfortunate conjunction of circumstances, aided by the causes above named, singly or together.

Now comes an oddity in the history of this floating sorrow. For over three years she had had an uninterrupted record of calamity, under good and bad agents and officers, which one may be sure were often changed. There was no question that her owners and managers had done all that care and money could do to make the ship successful. The only result had been the record above sketched, and a rising rate of insurance premiums.

The time now arrived when she could not be insured at all. The owners therefore had to choose between running her uninsured or letting her rot at anchor. They chose the former *and since then have had no trouble with the ship.*

A more cheerful and yet rather surprising incident marked the voyage of the American iron ship *Brynhilda* from New York to Port Elizabeth, South Africa, in September, 1918, when our coast was haunted by hostile submarines and all traffic was under rigid rules and secret official orders. Moreover, the harbor lights were doused or changed; all ships were sailed with lifeboats provisioned and swung outward, and all use of the radio was forbidden except in last extremity. These secret orders as well as routing were given to the master only when he was on the way to his ship.

The *Brynhilda* sailed one Saturday in late September, just about dusk. Two days later one of her lifeboats was picked up off Long Beach, badly stove in and otherwise damaged, and in a condition which aroused grave fears for the ship. As she had a wireless installation, the coast was at once swept with tracing messages, but without result. All likely ports were watched for news from incoming ships, but there were none that had seen or heard of the missing vessel. As time went on and she was due to be in wireless range of the west coast of Africa, endeavors were made to trace her from there, but there was absolute silence. The friends of the officers were in despair, the owners were gloomy and the original underwriters re-insured freely, paying as high as 60 percent premium. The ship was due about Christmas, but the conviction of her loss was so strong that no one expected to hear of her. It was supposed that her bones lay within one hundred miles of the Narrows.

On Christmas morning the *New York Herald* had this simple item in the Shipping News: "*Port Elizabeth, Dec. 21st. Arr. Am. Ship Brynhilda, New York.*"

One man in New York spent a large portion of his Christmas in getting hold of the families of the officers of the ship and repeating the *Herald* despatch as Christmas cheer. It was the most worth-while Christmas he ever spent—a real Christmas denouement.

What had happened was this. As soon as the tug had cast off, the ship broke out her sails and laid her course for the lightship. In the dark she was side swiped by the iron standard of a high channel buoy, carrying away a port lifeboat and part of the davits. The master would have turned back, but that would have meant two days loss of time, which was more than the boat was worth. He could not radio the accident, owing to the Navy instructions to use the wireless only in extremity. Under these circumstances, he decided to proceed, not doubting that the wrecked boat would sink with the weight of the davits and supplies. None of the tracer messages ever reached him; he had a prosperous voyage and was amazed to learn on arrival that his ship and crew had been given up for lost.

Deadweight

By Edwin C. Bennett*

Notwithstanding the fact the deadweight carrying capacity of a ship is the factor of greatest importance to shipowners, operators, charterers and those "who go down to the sea in ships," it is noticeable that while the meaning of the term deadweight is known in a general and superficial way, a true understanding of all that the term includes is known to but a comparative few of the shipping fraternity. This lack of a full and complete understanding of what deadweight actually includes is responsible for innumerable altercations and many lawsuits between sellers and buyers, owners and charterers and others engaged in marine transportation. To aid in clearing up such misunderstandings the following explanation is offered.

IF we exclude passenger liners and certain special ships we can safely assume that deadweight is the basic income earning factor of every commercial freight carrying vessel,—it is the one income earning factor into which all expenses incurred in operating the vessel must be resolved. It is the one factor of the vessel that is marketed and upon the success or non-success of that marketing depends whether the vessel earns a profit or incurs a loss.

Deadweight, as considered in a broad and all embracing explanation of the term, is the difference between the light weight of a vessel and the displacement at any specific draft. For instance, a vessel whose light ship weight is 3,380 tons and whose displacement at 23 feet draft is 11,300 tons has a deadweight at that draft of 7,920 tons. This deadweight, however, does not represent the weight of paying or income earning cargo the vessel can carry, for many items necessary for the operation of the vessel are included therein.

LIGHT SHIP WEIGHT

In order therefore properly to appreciate what deadweight is we must first know what is meant by light ship weight. Light ship weight is the total weight of the completed ship including its machinery with steam up and water in the boilers up to steaming level, water in the condensers, pumps, feed heater, permanent equipment such as tow lines, anchors, chains, etc., life and working boats, standing and running rigging, flags, awnings, navigating and engineering outfits and spare parts, mess, cabin and culinary outfits necessary to make the ship navigable and habitable. It does *not*, however, include coal or oil fuel either for boilers or galley use, consumable stores whether for engine, deck, cabin or galley use, drinking water, boiler feed and sanitary water, dunnage, ballast, both solid or liquid, crew and officers and their personal effects. The above excluded items are all part of the deadweight and therefore their combined weights must be deducted from the gross deadweight of the vessel at any specific draft in order to determine the actual weight of paying or income producing cargo that can be carried or marketed at that draft.

It will be seen therefore from the foregoing that when a vessel is ready to make a sea voyage a certain amount of its deadweight carrying capacity is used up even before a pound of cargo is taken on board. The amount thus taken depends, of course, upon the length of the voyage between ports for it stands to reason that a vessel whose length of voyage between ports is but 500 miles will require less fuel, water and consumable stores than a vessel whose length of voyage between ports is 2,000 miles.

DENSITY OF THE WATER MUST BE TAKEN INTO ACCOUNT

When it comes to a question of determining both the light ship weight and the gross deadweight of a vessel from her

draft figures forward and aft, the factor of the density of water must also be taken into account. It is fundamental that the weight of any floating object, such as a ship, is equal to the weight of water displaced, and, keeping in mind that at 62 degrees F. fresh water weighs approximately 62.4 pounds per cubic foot and salt water weighs 64 pounds per cubic foot, it follows that a ship floating in fresh water displaces a greater volume of water than if floating in salt water; or, in other words, the draft of water of the light ship is less in salt water than in fresh water. While there is also a difference in weight of water dependent upon its temperature—water at 85 degrees F. temperature being about $\frac{1}{4}$ pound lighter than at 35 degrees such refinement is very seldom taken into account in the general consideration of deadweight. As a matter of interest, however, in a 9,000-ton deadweight ship the difference in deadweight between sea water at 35 degrees and 85 degrees is about 50 tons at her load draft.

The great majority of shipowners, charterers, etc., in determining the deadweight capacity of a vessel for any specific draft refer to and read it from the deadweight scale or table supplied by the shipbuilder. As a matter of fact, it is the only information in their possession from which such information can be obtained, and, such being the case, it is imperative that it be correct and reliable.

Unfortunately, so many conditions are reflected in the computation of the deadweight scale, especially in the case of old vessels, that it is safe in saying a large proportion of the deadweight scales now in use on shipboard do not reflect the true deadweight that the vessel carries.

INACCURACIES IN DEADWEIGHT SCALE

In explanation of this assertion, it should be remembered that the deadweight scale or table is prepared by the shipbuilder's technical staff under conditions generally favorable to the vessel. Furthermore, while the shipbuilder appreciates the importance of an accurate deadweight scale, it is a matter of professional pride to show the greatest amount of deadweight for any specific draft.

At the time the shipbuilder determines the deadweight, the vessel has but few coats of paint, her ballast tanks are absolutely dry, the bottom of ship is clean, as are also the cargo holds, fuel bunkers, etc. After a vessel goes into commission, she acquires additional coats of paint, the water ballast, reserve feed water and other tanks, even when supposed to be pumped dry, contain a certain amount of water or oil, additions and changes are made to vessel, additional quarters are added, new floor covering is laid down, engine room spare parts or equipment are added—the vessel is converted to fuel oil burning while retaining her coal burning fittings, etc., all of which are accumulative and in the aggregate amount to a weight that has an appreciable bearing upon the amount of paying cargo that can be carried.

In the foregoing, the draft figures at the stem and stern of the vessel have been considered as being correctly located

*Naval architect-engineer, marine surveyor and appraiser, 15 Broad street, New York.

with reference to the under side of the vessel's keel, or in the case of a flat keel plate, from the underside of the keel outer buttstraps. A number of cases have occurred within the experience of the writer where the draft figures have been incorrectly located on the ship and therefore the amount of deadweight the vessel carried on any specific draft was incorrect in relation to the actual draft of the ship; or, if taken in relation to freeboard marking, it is generally less than what the vessel can actually carry.

It is desirable, therefore, that shipowners, especially in the case of old ships, or those known to have had extensive additions or alterations made thereon, have the deadweight scale or table checked up to assure themselves of its accuracy. Such a check should always be demanded by the prospective purchaser of an old ship in order to be assured that the deadweight as stated by the seller or as shown on the vessel's deadweight capacity tables is reasonably accurate and has taken account of the increased light ship weight that comes with years of service.

DEADWEIGHT CARRYING VS. PAYING CARGO CAPACITY

In order to illustrate more clearly the relationship between the deadweight carrying capacity and the paying cargo carrying capacity, there is given below the weights for a cargo carrying vessel of the usual type reputed to be of 7,800 tons deadweight, but which actually carried, at the time she was built, 7,868 tons at her legal summer freeboard draft—the vessel being outfitted for a voyage of 3,600 miles.

WEIGHTS FOR CARGO VESSEL OF 7,800 TONS DEADWEIGHT

	Light Ship, Tons	Deadweight, Tons
Weight of dry ship at time of her completion by shipbuilder	3,268	
Water in boilers, condensers, pumps, etc.	82	
Additions to structure and equipment added after vessel left shipyard	30	
Actual present light ship weight	3,380	
Coal for 3,600 miles plus reserve.....		700
Reserve feed water for boilers		120
Drinking water		20
Sanitary water		5
Galley stores, galley coal, etc.		15
Deck and steward's stores		25
Engine room stores		5
Crew and effects		6
Water in ballast tanks that cannot be removed by pump suctions		10
Dunnage for cargo		2
Non-income producing deadweight		908
Weight of income producing or paying cargo		6,960
Total gross deadweight		7,868

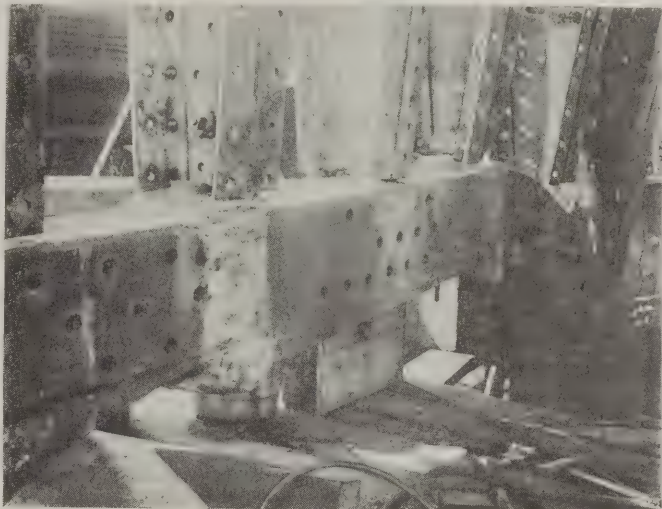
Inasmuch as the tons per inch at load draft were approximately 44, it will be seen that about 20 inches of the vessel's draft was taken up by non-income producing deadweight, or putting it in another way, about 11½ percent of the gross deadweight is required for non-income paying items. Of this 11½ percent some 90 percent is in turn taken up by the combined weights of coal and reserve feed water.

While it has but an indirect bearing upon the foregoing explanation of deadweight an analysis of the above table will show that in order to increase the weight of paying or income producing cargo that can be carried, it is necessary to reduce either the weight of the light ship or the fuel and boiler feed water or both. Any type of machinery that will reduce the consumption of fuel and feed water will obviously increase the weight of income producing cargo that can be carried and is therefore a subject that should be seriously investigated by all shipowners.

Resolute's Stern Frame Successfully Welded

ON November 17 an inspection of the transatlantic liner *Resolute* of the United American Lines, which was in dry dock at the Morse Dry Dock & Repair Company, Brooklyn, N. Y., revealed the presence of a fracture directly through a splice half way out on the 10 inch by 15 inch stern shoe.

To have replaced the old 16-ton casting by a new one would have cost many thousands of dollars and involved unshipping the old section, purchasing a new casting and installing and machining a new splice. This course of procedure would also have delayed work on other alterations to the vessel while in dry dock, preparatory to sending the ship



Repairing Stern Shoe of S. S. Resolute. Thermit Welds With Collar on Side Chipped Off to Allow Replacement of Plates

on a cruise around the world, which could not be attempted until the stern shoe was repaired.

It was found entirely feasible, however, to save much time and money by means of Thermit welding. Instead of making a weld through the broken splice, it was recommended that a more satisfactory job could be obtained by cutting out the splice and welding in a new billet by making two welds, thereby entirely eliminating any mechanical connection and obtaining one solid section of much greater than the original strength. The method of welding suggested was approved by the dry dock company, which in turn obtained the approval of German Lloyds, under whose registry the *Resolute* was classified.

Permission to weld being granted, the dry dock representatives lost no time in removing adjacent plates, cutting out the old splice and forging, machining and inserting a new billet, 4 feet in length, in place ready for the welding force to proceed. Work began at 9 A. M. Sunday, November 19, at which time the wax patterns were applied. By 5 P. M. the mold boxes were in place and had been rammed. Pre-heating was then started, using one heating gate on each side of each weld. Pre-heating was continued steadily until midnight, when the charges of Thermit in the crucibles, suspended by chains over the mold, one crucible on each side for each weld, were ignited and the welds poured simultaneously.

The welds were allowed to cool over night and the following day the mold was stripped off and risers and pouring gate removed. The collars of the welds were chipped off on the sides, in order to allow replacement of plates. The weld on inspection was found to be perfect in every respect and additional repairs were started under way promptly.

Recent Developments in Marine Insurance

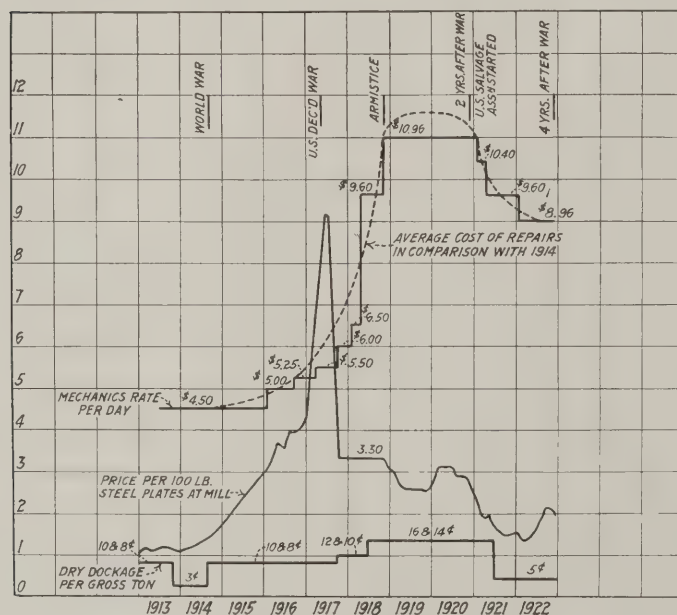
Review of 1922—High Repair Costs—Turkish Monopoly—
New P. and I. Bureau—Unseaworthiness—Danube Scheme

By "Bordereaux"

OF the year so recently ended it may be said to have been, so far as marine insurance is concerned, one of encouragement and advance. The reaction from the disastrous experiences of 1921 was marked, and the year closed with an improvement in premium volume, reduction of losses and general betterment of conditions. It was a distinct period of reconstruction. It opened under circumstances of discouragement, because many companies were failing and retiring, both here and abroad, and because losses were coming in steadily for three years' accounts. Foreign trade was almost dormant; there was practically nothing to write. Then things began to look up. The flow of losses abated, particularly as regards theft and pilferage, shipments of cotton and grain to Europe aroused something of the old animation in the market, and trade began to quicken from Cuba and South America. Thus, when 1922 passed out it left the marine underwriters with quite as much of an income as they had had the previous year, and considerably less money to have to pay for losses. It's encouraging.

Ship Repair Costs High

AN interesting graph has been prepared by the United States Salvage Association which reflects a comparative study of ship repair costs in the New York District covering the period from 1913 to and including 1922.



Data Compiled by United States Salvage Association Showing
Cost of Ship Repairs in New York District

The average cost curve is influenced chiefly by three factors: Labor rates, drydockage and the price of steel. These are the dominating influences, although there are other minor factors such as freight rates, overhead and handling charges, etc. This graphic picture shows that the cost of effecting repairs at the present time is about 100 percent greater than in pre-war days.

Dividing the total cost into its component parts, it is of

interest to trace the rises and falls in the cost of individual items. Take ship mechanics' wages, for example. Starting with an average wage of \$4.50 in 1914 and 1915, the scale rose rapidly until, for the two years subsequent to the armistice, it rested at \$10.96 per diem. It has declined somewhat since, but still stands at the high figure of \$8.96. Prices for steel plates at the mill present a no less significant history. As soon as the late war broke out they began to ascend from \$1 per hundred pounds until they reached \$4.50 a hundred shortly after the United States entered the conflict. The decline, when it came, was equally precipitant, reaching the \$3.30 level in the late fall of 1917. Early in 1922 it got down to \$1.30, when it started upward once more and is now in the neighborhood of \$2. Dry-dockage costs, on the per gross ton basis, rose to 16 and 14 cents from between 1918 until the close of 1921, but has since declined to 5 cents, which is practically the rate charged in 1914 and materially less than that of 1913.

Turkish Monopoly Proposed

TURKEY is accumulating confidence at such a rate that it plans making a monopoly of all kinds of insurance.

If its tentative arrangements go through it will expel all foreign insurance interests and found a bank to carry on the business. This might, at first blush, look bad for foreign merchants doing business in Turkey, but there will doubtless survive the principle of extra-territoriality—for that is something the European Governments will never relinquish—and the result will doubtless be that English and American shippers, for example, will insist upon coverage in companies whose strength they are acquainted with and will let the foreign-hating Turkish bank severely alone.

Government P. and I. Bureau

AS is generally understood, there are numerous liability hazards that are not covered by the ordinary marine insurance policy—such as personal injury, sickness, cargo damage, immigration fines, etc. These have heretofore been separately written by the American Steamship Owners' Protective and Indemnity Association, and Shipping Board vessels have been covered in that way. But it has been decided by the latter to withdraw the Emergency Fleet Corporation from this Association on February 20 and to insure its P. and I. liability in a new organization of its own launching, which is to be known as the United States Protective and Indemnity Agency, Inc. It is to be located in the Shipping Board offices in New York City, and Nathan A. Smyth, general counsel for the Shipping Board, has been selected to be its president. It will begin to operate on February 20.

The idea is to give this body a world-wide scope and representatives are being appointed in all the principal ports of the world. Close cooperation is to be had with managing agents and they will be given considerably more latitude as respects claim settlements. There is to be no separate insurance fund established, but current receipts will be used to meet claims. The field of the new bureau will be one of adjusting and investigation.

Relative to the past P. and I. experiences of the Shipping

Board, Commissioner Lissner has recently given out the following data:

The Shipping Board paid into the Steamship Owners' Association last year about \$5,000,000 in premiums, but later reduced this expense about \$2,000,000 by withdrawing insurance for its idle fleet.

Under the new arrangements the Emergency Fleet Corporation will carry its own insurance, just as is already done with regard to all other Government insurance risks. Losses will be paid out of funds appropriated by Congress for maintenance of the Emergency Fleet Corporation as a shipbuilding concern. The United States P. & I. Agency will serve only as a loss adjustment agency.

The former Shipping Board believed it advantageous to enter into the American Steamship Owners' Protective & Indemnity Association in order to build up this form of mutual marine insurance organization in America, whereas formerly all such organizations had been under British control. And, moreover, at that time the Shipping Board had its hands full with a construction program and the organization chaos growing out of the war pressure.

But now the American Steamship Owners' Association has expanded until it has entered on its books more than two million gross tons of privately owned shipping besides that belonging to the Shipping Board. And, also, the Shipping Board has built up an organization within itself capable of handling much of the work that has been handled by the American Steamship Owners' Association. The new arrangement will do away with most of this duplication of effort.

The withdrawal of the Shipping Board from the American Steamship Owners' Protective & Indemnity Association opens up a number of technical questions relating to the liability of the Shipping Board in connection with past transactions with the American Steamship Owners' Association. The Shipping Board believes itself entitled to large refunds on business handled by the association in the past. It is the intention of the Shipping Board to press these claims against the association so that in the final settlement an equitable adjustment may be made.

Average for Stiffening

CHARTERERS may maintain a claim to general average contribution against the owners of a vessel in such an instance as when it is necessary to remove coal that was taken aboard for stiffening and which subsequently became heated and imperiled the ship prior to loading. This was decided in a case recently tried before the United States Circuit Court of Appeals, *Aktieselskabet Fido v. Lloyd Brasileiro et al.*, 283 Fed. Rep. 62. The court held that all losses in a maritime adventure falling outside the contractual obligations of the parties, and which arise from a voluntary sacrifice of a part of the cargo, made to save the whole adventure from perishing, or which arise out of extraordinary expenses or expenditures of money incurred for the joint benefit of both ship and cargo, constitute a claim to general average contribution.

The circumstances of this case were unusual. Seven steel sailing vessels were involved, all the property of the Norwegian company, under charter by the respondents to carry full cargoes of coal from Hampton Roads, Va., to South American ports. The charter parties carried the anomalous provision that the charterer should furnish ballast, or a part cargo of coal, as stiffening, to enable the vessels to proceed from their inward ports of discharge under previous charters. Bituminous steam coal was taken on for this purpose at New York and Baltimore to make the run to Hampton Roads for the full cargoes. While the ships were waiting their turn at the loading pier of the latter place it was discovered that the coal stiffening had become so heated as to make it unsafe to load the balance of the coal full cargoes; and the stiffening was accordingly removed and entire new cargoes loaded, after which the vessels proceeded to their respective destinations in South America. It was agreed on both sides that the removal of the stiffening coal was necessary, but because of the delay and expense involved a difference of opinion arose between owners and charterers as to the rights and liabilities of the respective parties. One of the questions was as to when lay days began to run; this was decided by the court to be after the removal of the heated stiffening.

Amendments to Repairs Tariff

SHORTLY before the close of the year amendments to customs regulations were promulgated by Assistant Secretary of the Treasury Clifford, but they fail to help the underwriters out of their dilemma on the subject of repairs duty refunds. The Clifford amendments are intended to give the necessary procedure in case of making entries in connection with repairs made abroad subject to duty under the new tariff. They do not clear up any of the ambiguities of the new Act that are proving so puzzling. In a word, the amendments are of method only, prescribing procedure, and further Treasury rulings must be forthcoming, if vessel owners and marine underwriters are to know just where they stand in respect to such points as we pointed out in this department in our January issue.

Unseaworthiness

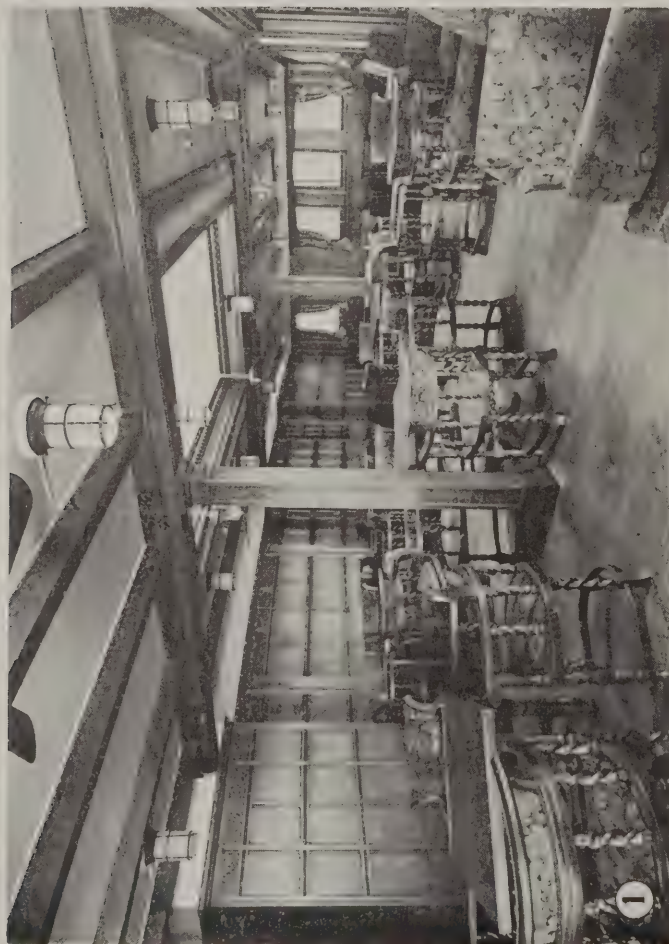
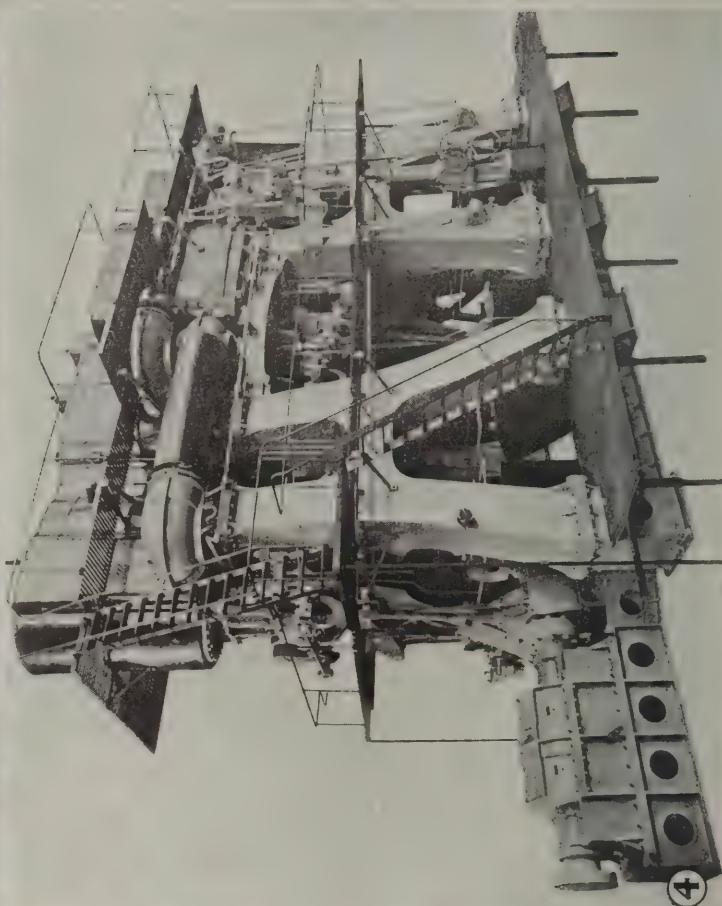
THE burden of proof on the issue of unseaworthiness in a suit on a marine policy rests with the insurer, and under the "Sue and Labor" clause the insurer is not liable for contribution to the expenses incurred. These are among the interesting points held by the United States Circuit Court of Appeals, Third Circuit, New York, in the suit brought by the Liberty Sand & Gravel Company, Inc., against the American Merchant Marine Insurance Company, 282 Fed. Rep. 514.

Liability on the Danube

HITHERTO it has been customary on the Danube for shipping companies to either totally exclude any liability for goods taken over by them, or to restrict it to such small sums that the shippers have been obliged to insure the goods themselves. But now the associated Danube shipping companies have decided to assume liability for loss, damage and non-delivery and all risks to cargo (excluding acts of God, peculiar nature of the goods, personal negligence of the despatcher or consignee, etc.). To this end, in addition to the freight and other charges, they are levying on the goods a special supplementary liability charge and, in consideration of this, will pay to the shipper the full market value of the goods on the day and place when and whence they are taken, and possibly also an additional sum of 15 percent of this value as compensation for lost profit. The shipping companies have also made arrangements that goods destined for transport on the Danube can be, or are, covered for the preliminary or subsequent railway transport, in so far as the receiving railway station and the preliminary and subsequent railway transport and the railway station at the point of destination lie within the territory of the Danube States, and so long as the preliminary and subsequent railway transport is not used as a means of avoiding transport by water. Special supplementary charges are to be levied for the handling of goods during the winter.

Company Merger

THE Washington Marine Insurance Company, which was organized in 1918 and has chiefly done a marine business, has been merged with the United States Lloyds of 1 South William street, New York. The assets and outstanding business of the former were taken over as of January 1, 1923, and the New York Insurance Department has given the merger its official sanction. Thus passes still another of the "war babies" that were attracted to marine insurance by the glittering prospects of war risk business but could not find a reason for existence when there was nothing in sight but straight marine insurance.



S. S. City of Nagpur; (1) First Class Smoking Room, (2) First Class Lounge, (3) Veranda Cafe, (4) Main Engine



Passenger and Cargo Steamship City of Nagpur

Recently Completed by Workman, Clark and Company, Ltd.,
Belfast, Ireland, for City Line Fleet of the Ellerman Lines, Ltd.

THE *City of Nagpur*, a passenger and cargo steamer of the shelter deck type, over 490 feet in length, with a tonnage of 10,200 tons, has just been built by the well-known Belfast shipbuilding and engineering firm of Messrs. Workman, Clark & Company, Ltd., under special survey for the highest class in Lloyd's Register and to fulfill the latest requirements of the British Board of Trade for passenger service between Great Britain and India.

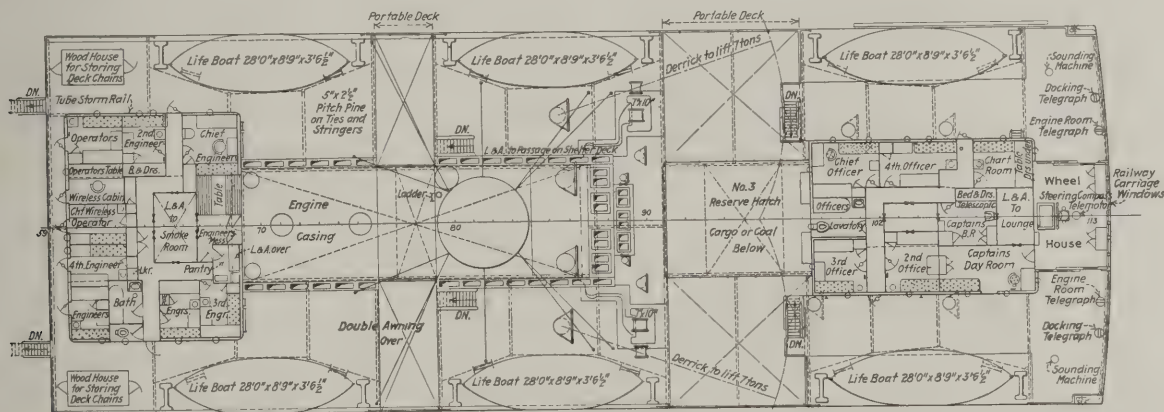
The vessel is fitted with the latest approved safety appliances, close spaced watertight bulkheads carried up to the superstructure deck, wireless telegraphy, and boats for all, the boats being handled by mechanically operated davits. A motor driven emergency dynamo is fitted on the boat deck,

ventilated and each is provided with a large window or side-light, electric fan, wardrobes, large mirror and porcelain wash basin with a continuous supply of fresh water. All rooms are heated by steam and lighted by electricity.

A large number of single berth, two berth and three berth cabins are provided, and communicating doors are arranged between the staterooms so that they can be used en suite if desired. A number of the staterooms are provided with beds instead of superimposed berths.

FIRST CLASS PUBLIC ROOMS

The dining saloon on the shelter deck extends nearly the full width of the ship. In this room the paneling is in the



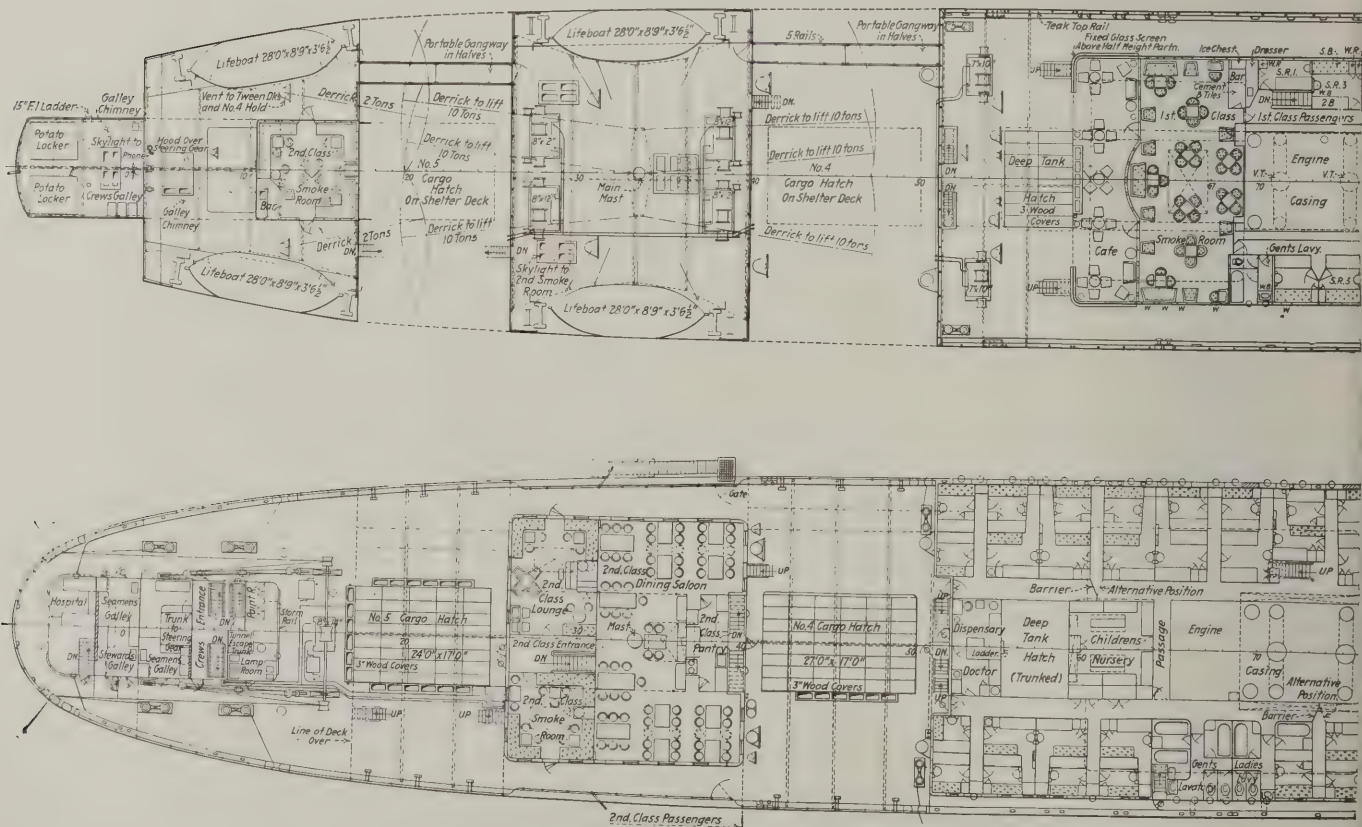
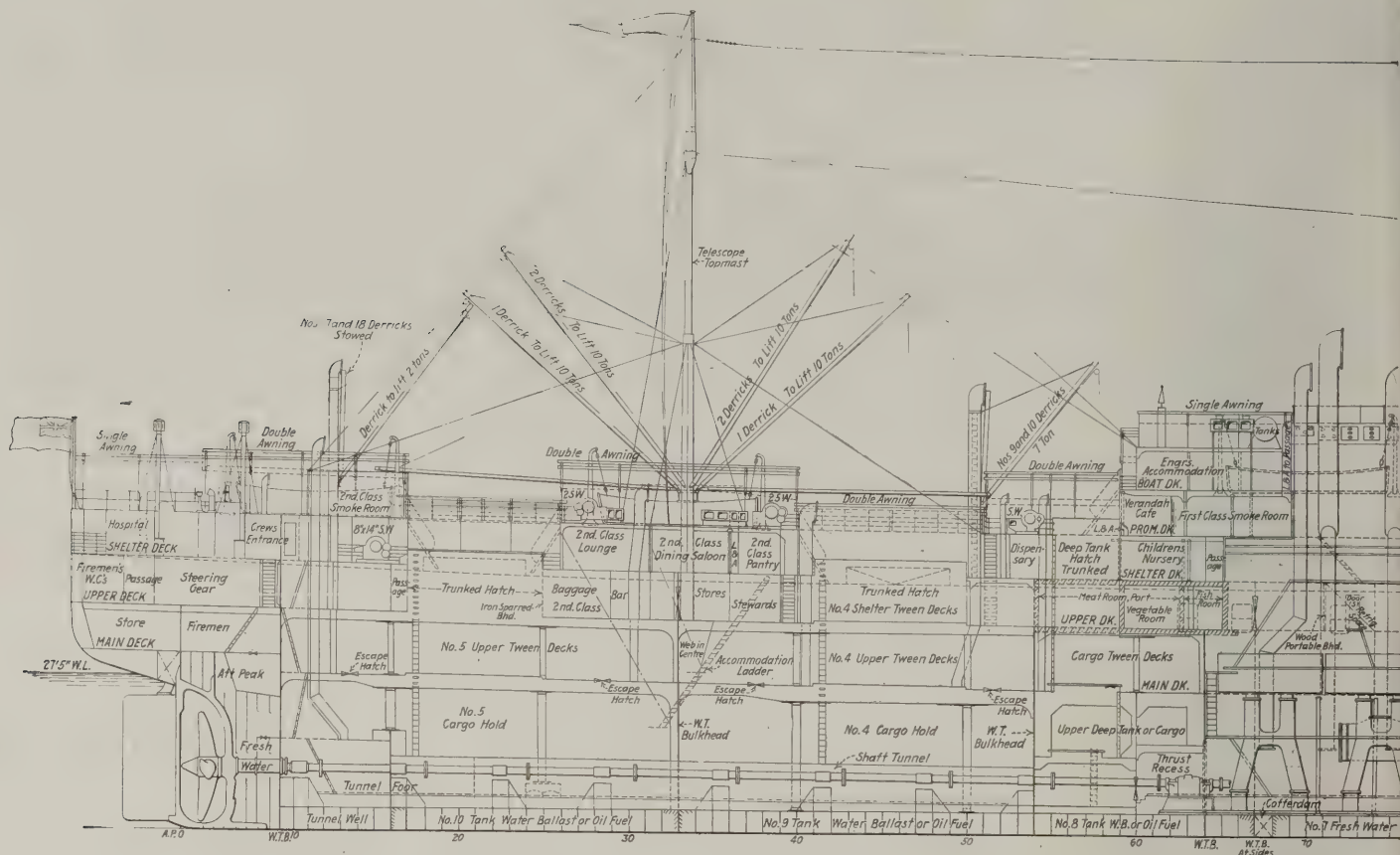
capable of carrying on the lighting and wireless service. This dynamo also supplies power to drive an electric pump for emergency service.

PASSENGER ACCOMMODATIONS

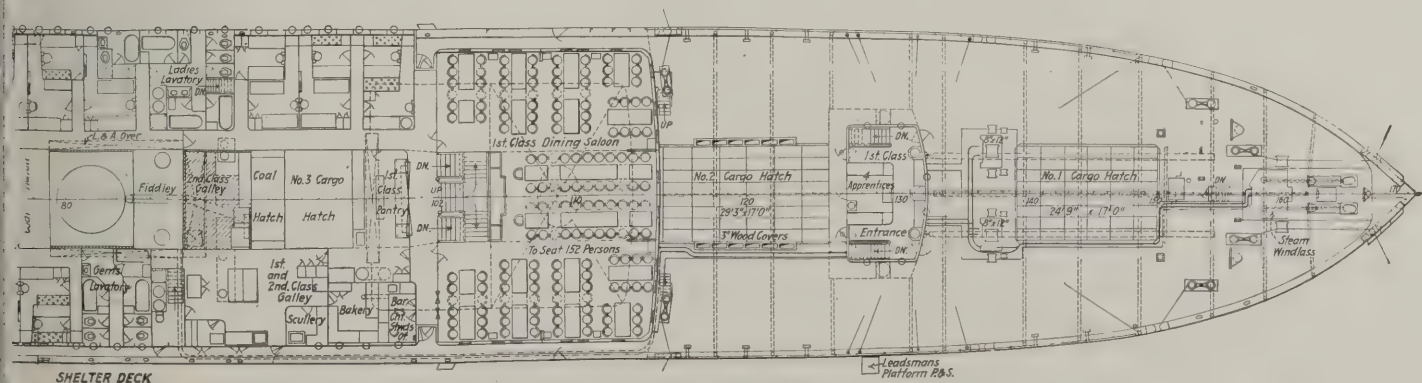
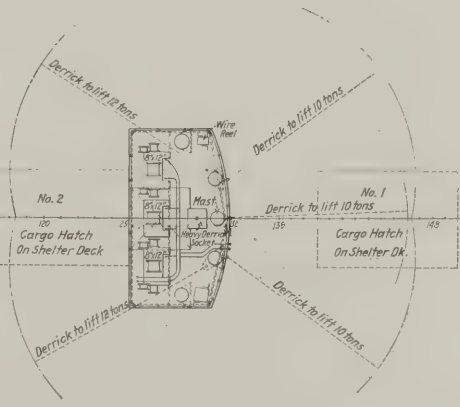
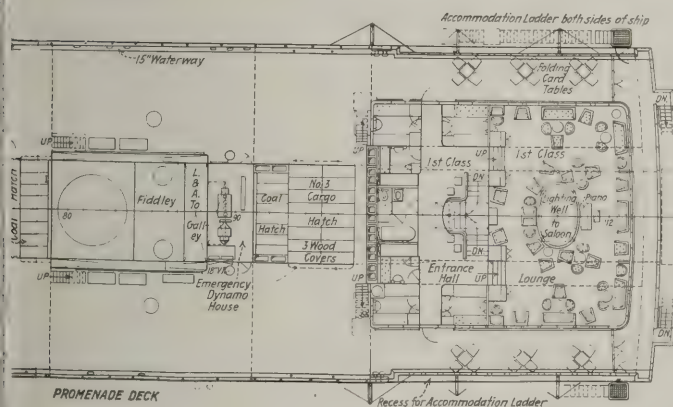
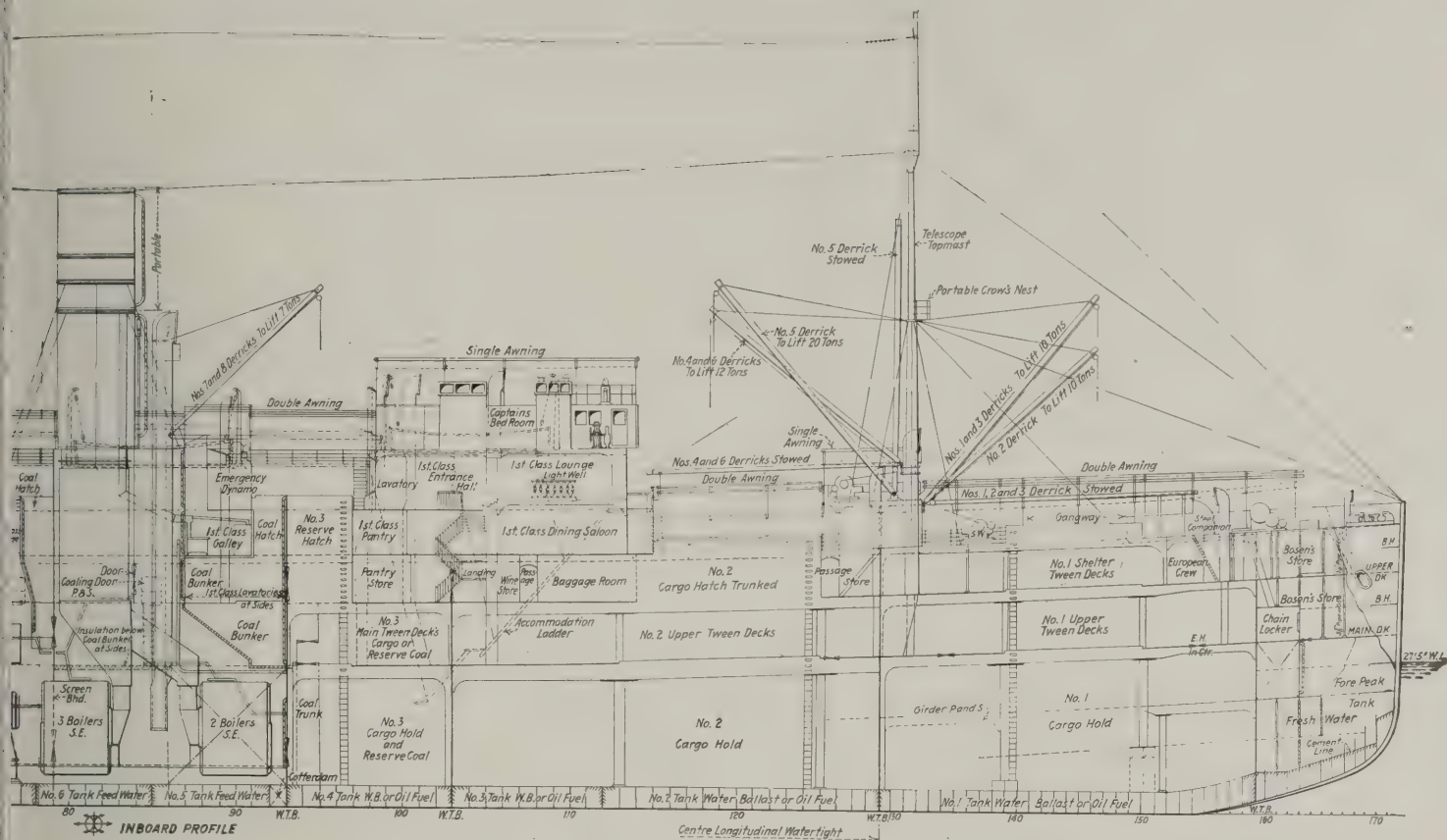
In designing the vessel special attention has been given to the arrangement of the passenger accommodation, provision being made for 226 first class passengers in staterooms arranged amidships on the upper, shelter and promenade decks, while 92 second class passengers are accommodated in staterooms on the upper deck. All the staterooms are roomy, well

Georgian style, painted in delicate tones of ivory with gilt enrichments. Large rectangular windows at the front and sides, together with a central well overhead, afford abundant light to all parts of the room, while numerous electric fans fitted on the ceiling add to the ventilation. A broad mahogany staircase, with metal balustrades, leads from the saloon to the main entrance hall which is situated on the promenade deck above.

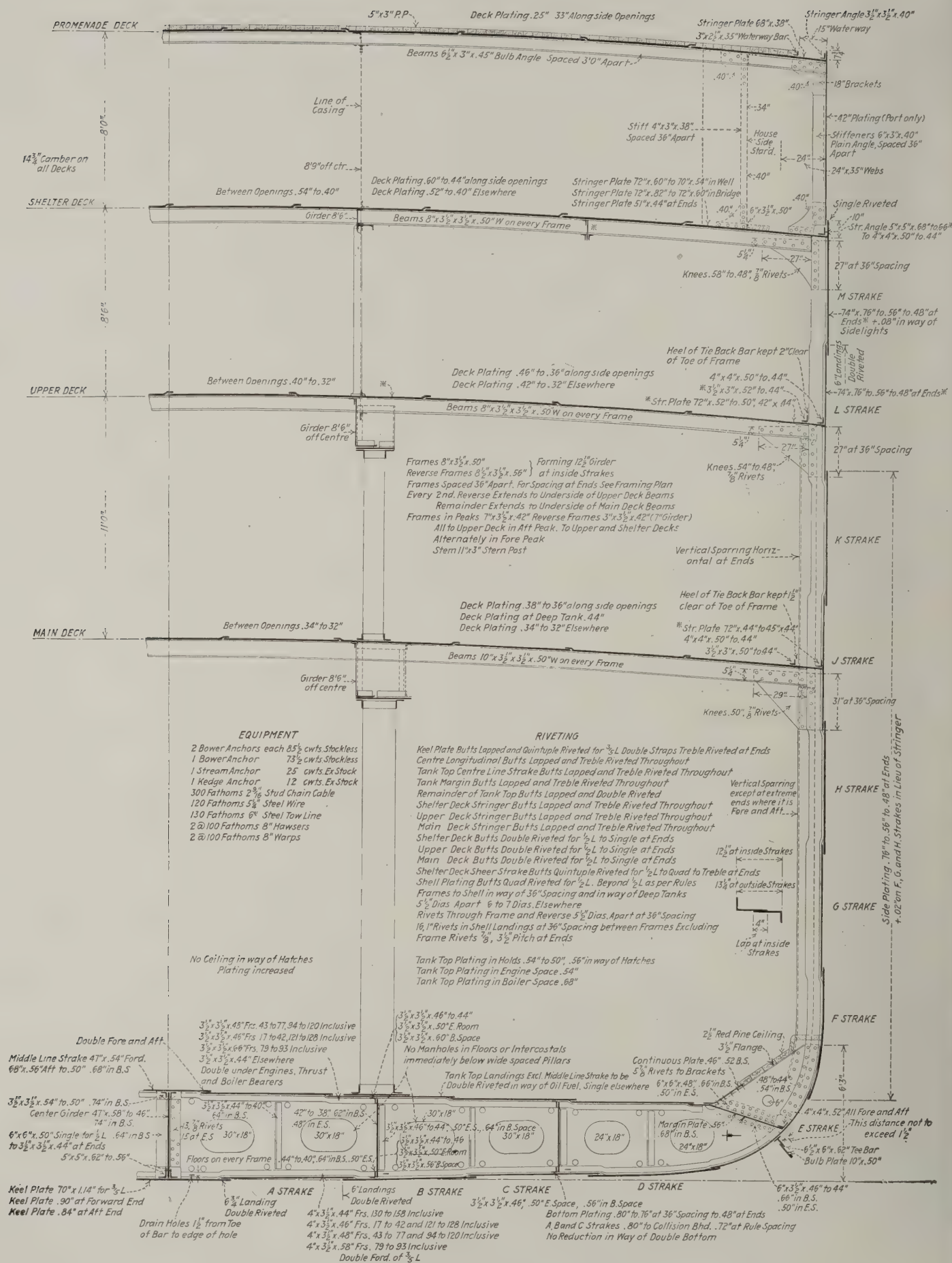
The lounge adjoining the entrance hall is decorated in the Louis XIV style in white and gray. This room is artistically furnished and is abundantly lighted in front and at the



Inboard Profile and Plans of Promenade and Shelter Decks



of Passenger and Cargo Steamship City of Nagpur



sides by rectangular windows and overhead by a handsome stained glass roof light.

The first class smoking room, situated at the after end of the promenade deck, is a large airy apartment tastefully furnished and decorated in oak. The wall paneling is in the Tudor style relieved by prints and engravings of the old masters. Rectangular plate glass sliding windows at the sides and a large decorative skylight overhead give ample light and ventilation.

Adjoining, and forming an extension of the smoke room, is the verandah cafe extending from side to side. The walls are stone color with teak trellis work, and boxes of flowers and large palms contribute to the decorative effect.

SECOND CLASS PUBLIC ROOMS

The second class public rooms are situated in a separate deckhouse on the shelter deck. The dining saloon is decorated in white with a dado of polished mahogany. The room is ventilated and lighted by large rectangular windows at the sides and forward end and by a skylight overhead. Immediately abaft is the entrance hall, from which a mahogany staircase leads to the staterooms.

The second class smoking room, paneled in oak, adjoins the entrance hall. A supplementary smoking room has also been provided on the after boat deck for the use of the second class passengers.

The second class lounge adjoining is pleasingly decorated in white, with a polished mahogany dado.

A large section of the promenade deck space on either side at the forward end abreast the lounge is enclosed by a steel screen in which large sliding windows have been arranged. The whole combines to form an ideal open-air lounge regardless of the weather.

CARGO HANDLING ARRANGEMENTS

For cargo handling the vessel has six hatches served by a total of 16 derricks (including one for heavy lifts) and 14 steam winches. These winches which are situated near the passenger accommodation are of the silent type, to avoid the vibration and noise generally associated with working machinery.

The cargo holds are built on the wide spaced pillar and girder principle, which gives a minimum amount of obstruction in dealing with large consignments.

PROPELLING MACHINERY

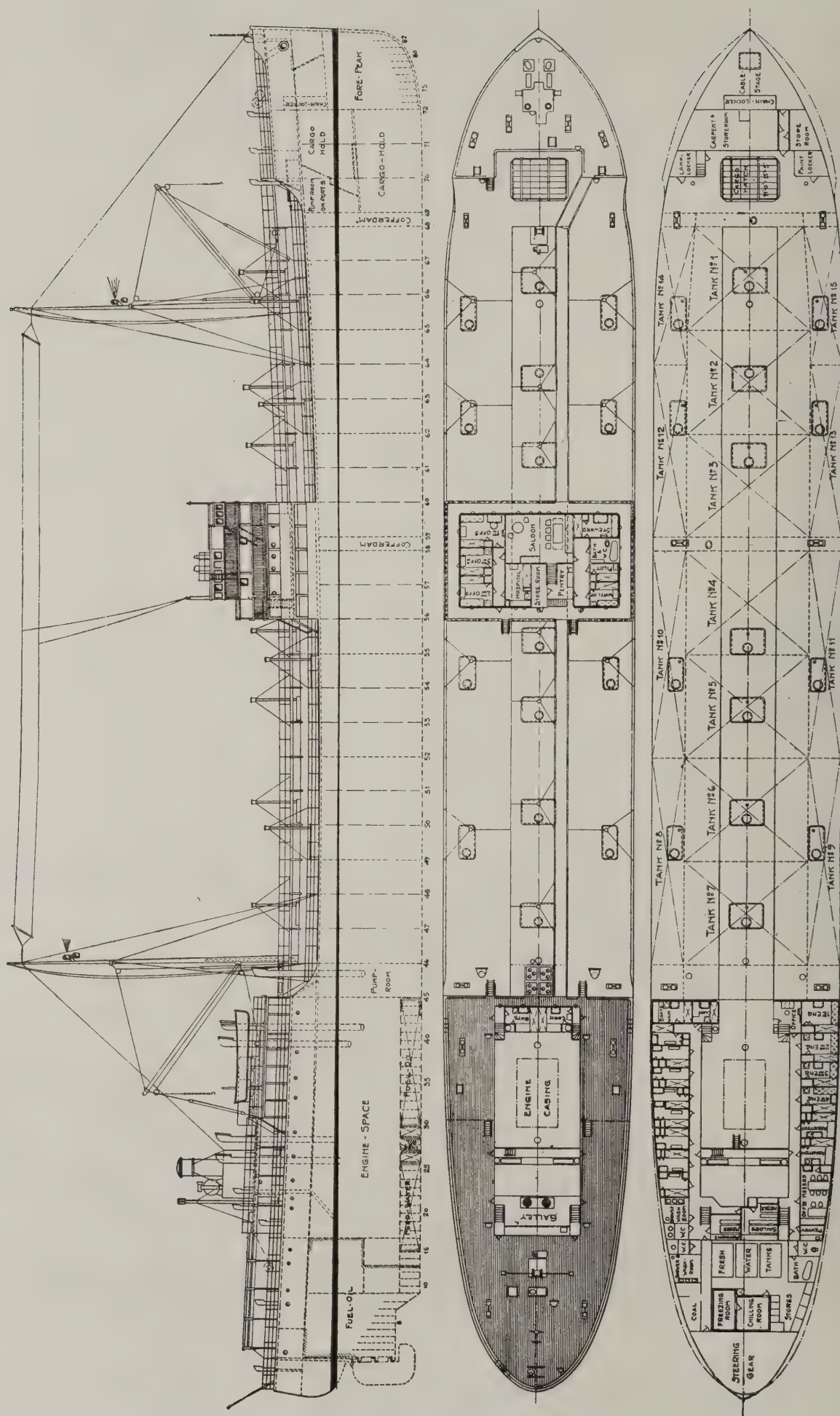
The propelling machinery, also constructed by Messrs. Workman, Clark and Company, Ltd., consists of one set of quadruple expansion engines balanced on the Yarrow, Schlick and Tweedy system, capable of developing over 6,000 indicated horsepower. Steam is supplied by five Scotch boilers fitted with forced draft and arranged to burn either coal or oil fuel. The electric power is generated by three large dynamos, which supply the lighting of the ship, the wireless telegraphy apparatus and drive the numerous auxiliary motors.



Photo Kadel & Herbert News Photos.

Dry Law Forces American Ship Under Registry of Panama. S. S. Resolute Now "Wet" on World's Tour

The S. S. Resolute of the United American Line, just recently built, one of the finest afloat, leaves on a world's tour under the registry of the Panama Government. Just recently the American flag was hauled down and the Panama flag substituted to enable the ship to make the world's tour without infringing America's dry law.



Tank-Motorship Oljaren, of 7,700 Tons Deadweight, Built by Aktiebolaget Götaverken, Göteborg, for the Rederiaktiebolaget Transatlantic, Göteborg, Sweden

Tank-Motorship Oljaren

General Information

Service: Transportation of oil in bulk.
Builder: Aktiebolaget Götaverken, Göteborg, Sweden.
Owner: Rederiaktiebolaget Transatlantic (The Transatlantic S. S. Co., Ltd.), Göteborg, Sweden.

Characteristics

Length, overall 394' 3"
 Length, B. P. 380' 3"
 Breadth, molded 55' 0"
 Depth, molded 30' 0"
 Draft, loaded 24' 13/4"
 Draft, light 19' 6"
 Block coefficient 0.76
 Midship section coefficient
 Longitudinal coefficient
 Speed, loaded, knots 11
 Cruising, radius, nautical miles
 Framing
 Class

Tonnages

(In tons of 2,240 pounds)

*Weight of Hull
 **Weight Propelling Machinery
 Deadweight Capacity 7,700
 Displacement

(In tons of 100 cubic feet)

Gross register 5,481
 Net register 3,247
 *Weight of Hull includes Hull Proper, Hull Fittings, Equipment, and Outfit.
 **Weight of Propelling Machinery includes Engines, Boilers (Wet), Shafting, Propellers, and Machinery Space Auxiliaries.

Canal Ratings

(In tons of 100 cubic feet)

	Gross	Net
Suez	5,547	3,638
Panama	5,634	3,511

Equipment

Anchor
 Chains: 2—135 Fathoms, 2 3/16".

Rudder

Area
 Dia. Stock
 C. Press. abaft C. L. pintles.....

Complement

Deck officers 4
 Deck crew 13
 Engineer officers 5
 Engineer crew 9
 Purser's and steward's department
 Total officers and crew 31
 First-class passengers 1
 Second-class passengers
 Third-class passengers
 Total passengers 1
 Total complement 32

Handling Equipment

No.	Type	Capacity	Length
Derrick posts			
Masts	2		
Booms	2	3 & 5 tons	
Discharging Capacity			

Deck Machinery

(Number, Size, Type)

Steering Gear: Electro hydraulic 20 B. H. P. motor—600 r.p.m.
 Windlass: 1 electric, 60 H. P.
 Capstans
 Winches: 2 electric, 3-ton forward, 5-ton aft.

Life Saving Equipment

Lifeboats	No.	Type	Length
Lifeboats	2		25'
Workboat	1		15' 8"
Workboat	1		15' 4"

Propelling Machinery

Engines

Number 2
 Type 6 cyl. 4 cyc., single acting
 Size bore, 23.2"; stroke, 35.5"
 Horsepower, total indicated 2,600

Propellers

Number 2
 Type solid bronze
 Weight
 Diameter 10' 2"
 Pitch 9' 5"
 R. P. M. 130
 Projected area
 Developed area

Auxiliary Machinery

(Number, Size, Type)

Machinery Space
 3 single acting, 4-cycle, 2-cycle Diesel engines, 75 B. H. P. each.

Air Compressors, 1 electric, 90 H. P.: 1 steam driven.

1 boiler, donkey type, 500 sq. ft., 100 lbs.

1 aux. tank heating, 100 sq. ft. surface.

Pumps:

(2) centrifugal cooling water, elec., 15 H. P., 120 tons per hr.

(2) sets lubricating in pairs, electric, 10 H. P., 18 tons per hr.

(1) oil transfer, electric, 15 H. P., 50 tons per hr.

(1) ballast, electric, 15 H. P., 150 tons per hr.

(2) sets bilge and sanitary, electric; 6.5 H. P.; bilge, each 20 tons per hr.; sanitary, each 15 tons per hr.

(1) donkey pump, 42 tons per hr.

(1) ballast and bilge, electric, 7 H. P., 42 tons per hr.

Cargo Pumps:

(2) centrifugal, each 250 tons per hr., elec. 36 H. P.

(1) drain, electric, 36 H. P., 100 tons per hour.

Refrigerating Machinery

(1) elec. driven CO₂ engine, indirect expansion, 4,000 cal. per hr.

Electric Equipment

Generators: 3—50 K. W., 220 V.
 Radio: 1—2.5 K. W. gen., 4 K. W. motor.
 Emergency: 1—5.8 K. W. gen., 7 K. W. motor.

Holds

No.	Length	Hatches
1	29' 6"	1-11'x15' 5"
Capacity dry cargo:		
Lower hold	Bales, 14,055 cu. ft. Grain, 16,210 cu. ft.	
Between decks	Bales, 17,234 cu. ft. Grain, 19,247 cu. ft.	
Total bales	31,289 cu. ft.	
Total grain	35,457 cu. ft.	

Capacities

Cargo Space

Compartment

15 oil cargo tanks, capacity oil, $\gamma = 0.87$.
 Tank No. 1 883 tons
 Tank No. 2 901 tons
 Tank No. 3 875 tons
 Tank No. 4 857 tons
 Tank No. 5 852 tons
 Tank No. 6 852 tons
 Tank No. 7 860 tons
 Tank No. 8 390 tons
 Tank No. 9 390 tons
 Tank No. 10 398 tons
 Tank No. 11 398 tons
 Tank No. 12 342 tons
 Tank No. 13 342 tons
 Tank No. 14 266 tons
 Tank No. 15 266 tons
 Total 8,872 tons

Refrigerated Space

Compartment	Cu. Ft.
Freezing and chilling room for ship's provisions.	

Bunkers

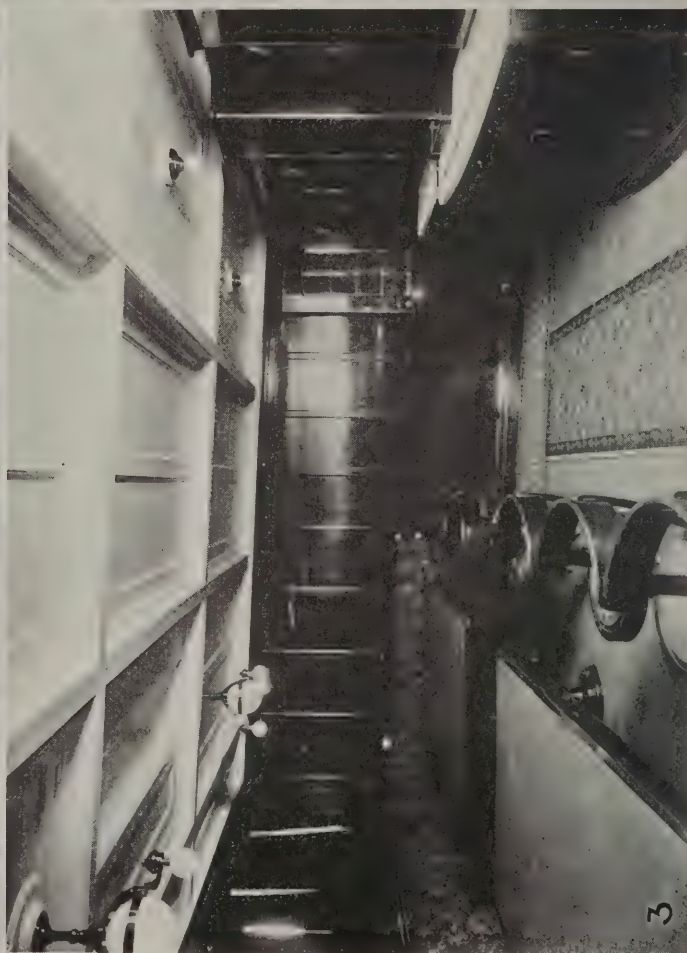
Fuel and Lubricating Tanks

Compartment	Tons
Aft. peak	399
Inner bottom (engine space)	162
Inner bottom (engine space) Lubr.	14
Total Fuel Oil	561

Tanks

Compartment	Tons
Fore peak (water ballast)	173
Inner bottom (engine space) feed water	40
3 fresh water tanks, total capacity	30

Compartment	Tons
Total	243



M. S. Tennessee: (1) Deck View, Looking Forward; (2) Deck View, Looking Aft; (3) Saloon; (4) Owner's Suite



Motorship Tennessee on Trial Trip

Twin-Screw Diesel Motorship Tennessee

Norwegian Motorship of 11,000 Tons Deadweight Capacity

Built by Burmeister and Wain for Australian Service

THE twin screw motorship *Tennessee*, just completed by Messrs. Burmeister & Wain, Ltd., Copenhagen, Denmark, to the order of Wilh. Wilhelmsen, Tensberg, Norway, is a sister ship to the *Teneriffa* and *Thalatta*, recently delivered to the same owners. The vessel is specially designed for long voyages, her oil fuel capacity being sufficient for a radius of over 30,000 miles.

The vessel is built to Lloyds Class 100 A1 special survey, awning deck with freeboard and with certificate for carrying oil fuel in the double bottom.

The leading particulars are as follows:

Length overall	444 feet 4 inches
Length between perpendiculars	425 feet 5½ inches
Breadth molded	55 feet 0 inches
Depth molded to awning deck.....	38 feet 6 inches
Depth molded to upper deck.....	30 feet 6 inches
Depth molded to lower deck	22 feet 5½ inches
Gross tonnage	7,124
Net register tonnage	4,482
Capacity of holds, about.....	570,000 cubic feet grain
Oil fuel capacity, about.....	1,300 tons
Deadweight tonnage, about.....	11,000
Draft loaded	29 feet 0 inches
Average speed at sea	11½ knots
Normal indicated horsepower.....	3,100
Normal consumption of fuel oil per 24 hours	10 tons

The hull is subdivided into eight compartments by means of seven watertight bulkheads carried up to the upper deck,

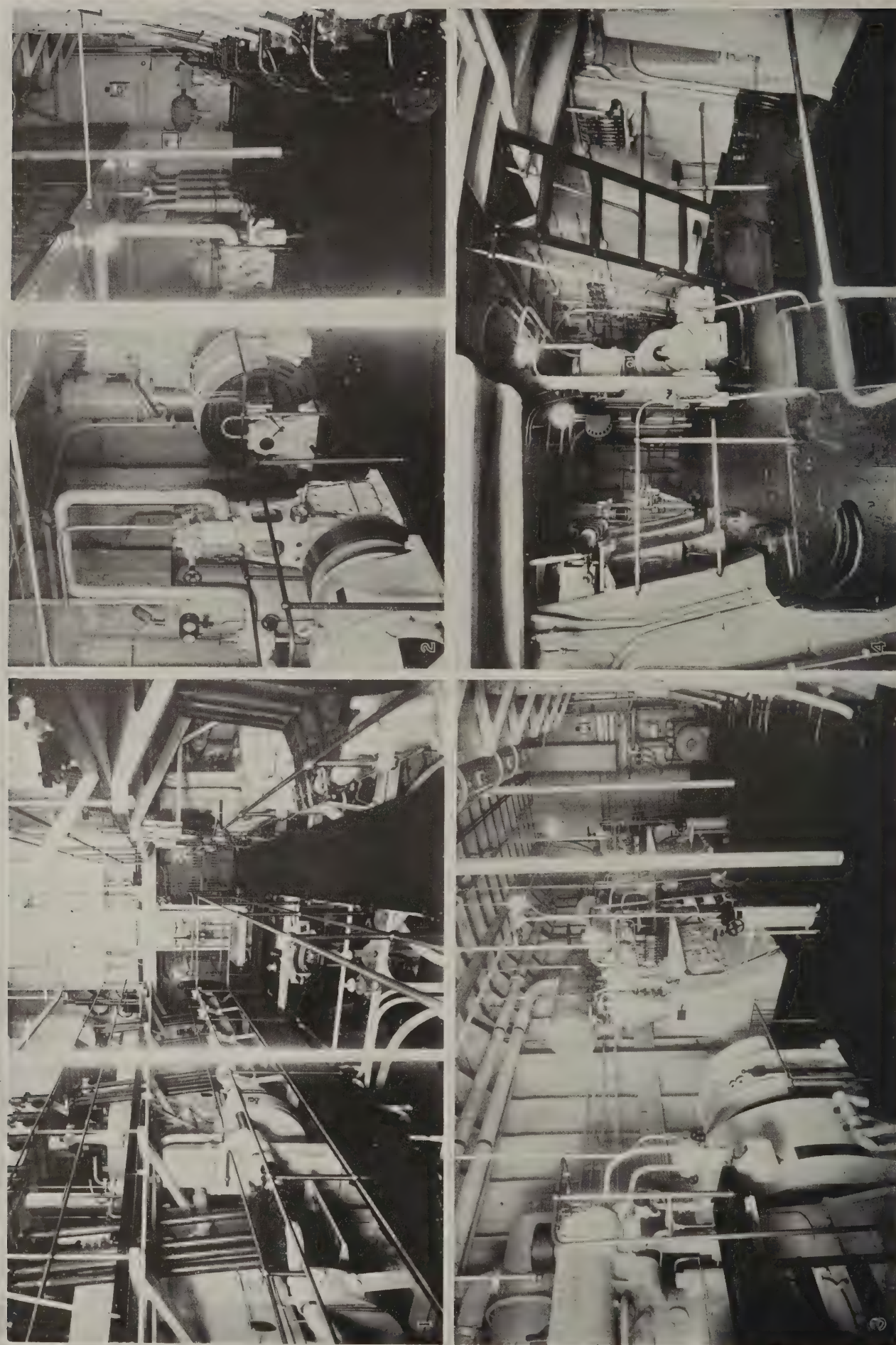
there being five cargo holds, three forward of the machinery space and two abaft the machinery space. A double bottom tank extending from peak bulkhead to peak bulkhead is fitted for the carriage of oil fuel or water ballast and in addition a deep tank for oil fuel is fitted between the shaft tunnels in No. 4 hold. The fore peak is arranged for water ballast and the aft peak for fresh water.

The ship has three complete decks of steel supported by a system of girders and wide spaced pillars in the holds, giving a good clear space for the stowage of cargo. The cargo hatches have a width of 18 feet and an average length of about 35 feet.

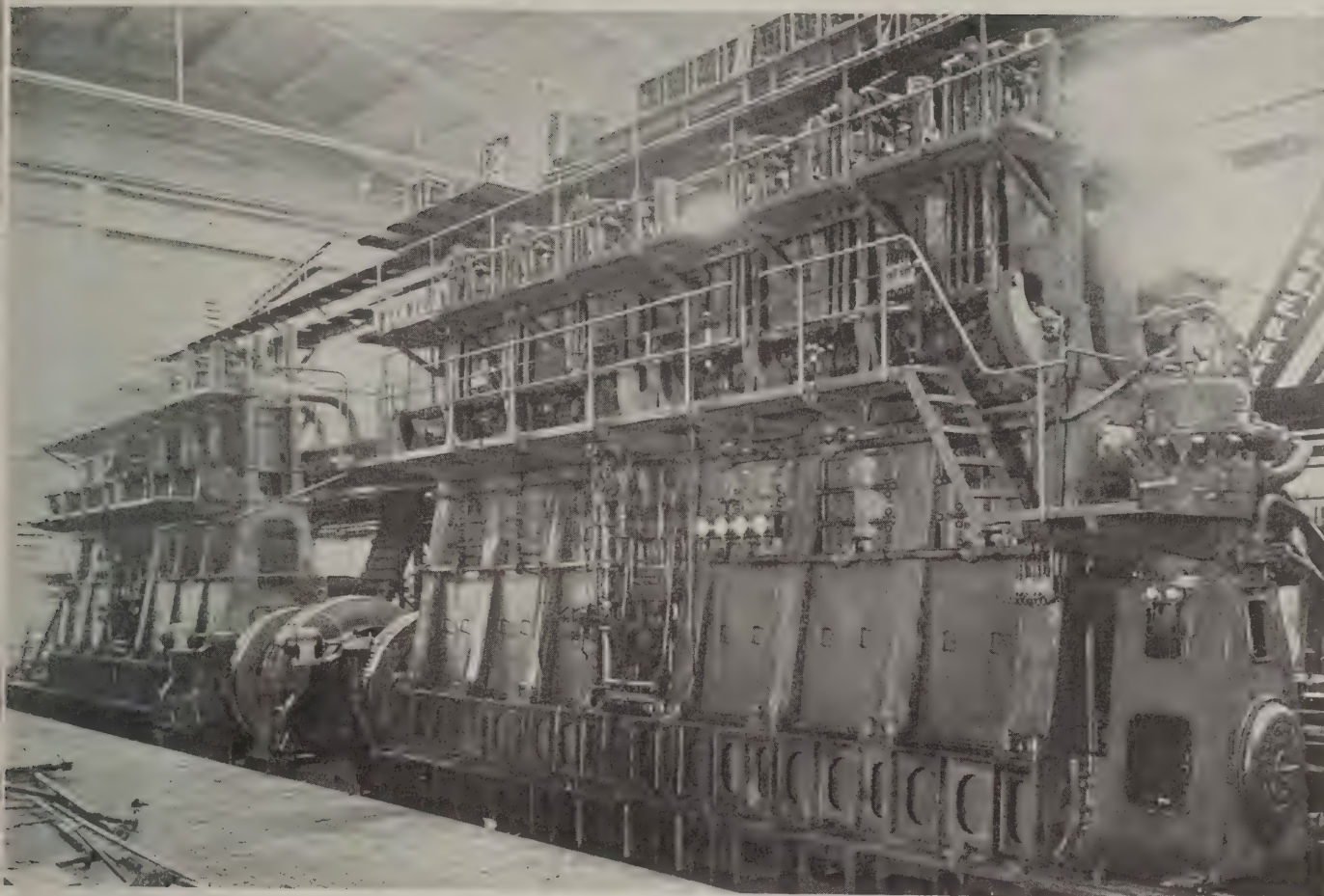
CARGO HANDLING GEAR

To facilitate the rapid handling of the cargo two steel tube cargo derricks capable of lifting 3 tons in single purchase and 5 tons in double purchase are fitted at each hatchway and in addition thereto there are two 2-ton derricks fitted at No. 4 hatch. For manipulating heavy lifts there is a 25-ton derrick fitted on the foremast at No. 2 hatch and a 10-ton derrick on the mainmast at No. 3 hatch, both arranged for the expeditious handling of heavy shipments.

All the cargo winches are electrically driven and are of Allmänna Svenska Elektriska Aktb. make. There are eight 3-ton winches, two 5-ton winches and two 2-ton winches for working the cargo derricks and also a heavy winch on the



M. S. Tennessee: (1) View of Main Engines from Lower Platform; (2) Starboard Side of Engine Room, Showing Pumps; (3) Port Side of Engine Room, Showing Auxiliary Engines; (4) View Between Main Engines



Main Engines of Motorship Tennessee on Test Block

deck aft fitted with extended ends and large warping drums for warping purposes.

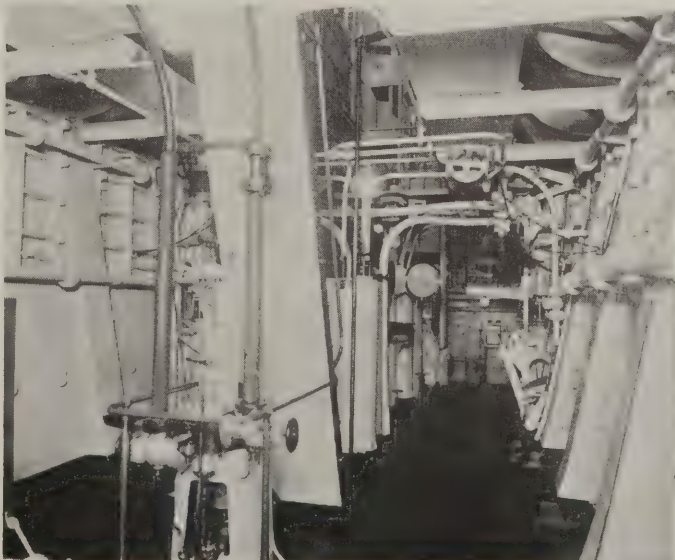


Top of Main Engines

The windlass is of Clarke, Chapman & Company's make, suitable for 2 5/16-inch diameter chain cables and is electrically driven. The steering gear is of the electro-hydraulic Hele Shaw type from Hastie & Company, Greenock, and is controlled from the bridge by means of a telemotor. An emergency steering column is also fitted on the top of the deck house aft.

ACCOMMODATIONS

The saloon is arranged in the foremost deck house and is tastefully fitted out in polished mahogany. There are also four 2-berth passenger cabins excellently fitted out to meet



Maneuvering Platform, Looking Forward

the requirements in the tropics, likewise a special suite of apartments for the owners' private use.

The captain's accommodation consisting of bedroom and sitting room in polished mahogany is conveniently arranged in the deck house below the commanding bridge. The accommodation for the officers and engineers is fitted in the midship deck house abreast of the motor casing in spacious, well fitted out cabins. The crew are berthed aft, the sleeping accommodation is arranged below the awning deck in well lighted and well ventilated cabins for two men in each, the messrooms being arranged in the deck house above.

A 1¼ kilowatt Marconi wireless telegraph station with accommodation for the wireless operator is fitted in the deck house on the boat deck.

The culinary arrangement is in accordance with the latest practice, refrigerated provision rooms, ice generators, etc., being provided for. Electric light is installed throughout the ship.

A fire extinguishing installation, consisting of the Lux, Ltd., CO₂ system, is fitted with pipe connection to all cargo holds.

PROPELLING MACHINERY

The machinery is of Burmeister & Wain's standard type for twin screw ships. The particulars of the main engines are as follows:

2 Burmeister & Wain 4-cycle 6-cylinder Diesel motors.	
Diameter of cylinders	630 millimeters
Length of stroke	960 millimeters
Revolutions per minute	125
Indicated horsepower	3,100
Brake horsepower	2,400

The main engines are of the short stroke, forced lubricated crosshead type, with three stage compressors for supplying

the necessary injection air for atomizing the fuel oil, fitted at the fore end of the engine.

All auxiliary machinery in the engine room as well as the deck machinery is electrically driven, the necessary current being supplied by three 60-kilowatt Diesel dynamos. The voltage of the current is 220 and for lighting purposes it is transformed down to 110 volts by means of a motor generator.

Each of the generators is sufficient for supplying the necessary current under normal working conditions at sea whereas two or all three have to be started when maneuvering, with the maneuvering compressor running, or when loading or discharging cargo. A small cross tube boiler of about 100 square feet heating surface is fitted for supplying the necessary steam for the steam heating installation in the accommodation.

The trial trip was run on September 28 in the sound at Copenhagen, the following results being obtained:

Mean draft	9 feet 8 inches
Displacement	4,415 tons
Indicated horsepower, average	3,640
Revolutions per minute, average	144
Mean speed	12.6 knots

During the consumption trial, the main engines developed 3,434 indicated horsepower at 137.7 revolutions per minute, on a fuel oil consumption of 0.298 pound per indicated horsepower per hour, the net calorific value being 18,274 British thermal units including the consumption of auxiliary engines producing the necessary current for the auxiliary machinery, steering gear and electric light.

After successfully finishing her trials, the ship returned to the builders' yard to land the officials and trial trip crew and left Copenhagen on the following day on her maiden voyage to Australia.

Supply Ship for Commercial Pacific Cable Company

Staunch Steamer Designed for Continuous Service by Cox and Stevens Is Being Built by the Sun Shipbuilding Company

THE Commercial Pacific Cable Company, of the Mackay system of Commercial Cable-Postal Telegraph, has ordered a steel seagoing cable repairing and supply ship for its Pacific cable service. The vessel, designed by Cox and Stevens, naval architects, New York, is being built by the Sun Shipbuilding Company of Chester, Pa. On completion she will be stationed at Honolulu and used for the transportation of staff, supplies and equipment between the Commercial Pacific Company's station at Honolulu and Midway Island, and also for cable repairing purposes.

This new ship, which is to be named the *Dickenson* and is being built to Lloyd's classification, is of the following dimensions:

Length overall	189 feet, 9 inches
Length on waterline	167 feet, 3 inches
Beam molded	30 feet, 0 inches
Depth molded to shelter deck	22 feet, 6 inches

The vessel is of the shelter deck type, with single screw, with steel deckhouses on the shelter deck, machinery amidships, two pole masts on which steadying sails will be set, elliptical stern and cable ship bow, with the usual appliances for handling the cable forward. As the service in which she will be engaged will mean continuous and extended voyages at sea, particular attention in the design has been paid to seaworthiness and strength of construction. In addition, as the ship will be for the most part used in tropical regions, the accommodations are unusually well arranged as regards

roominess and ventilation in order that those on board may be as comfortable as possible under all conditions.

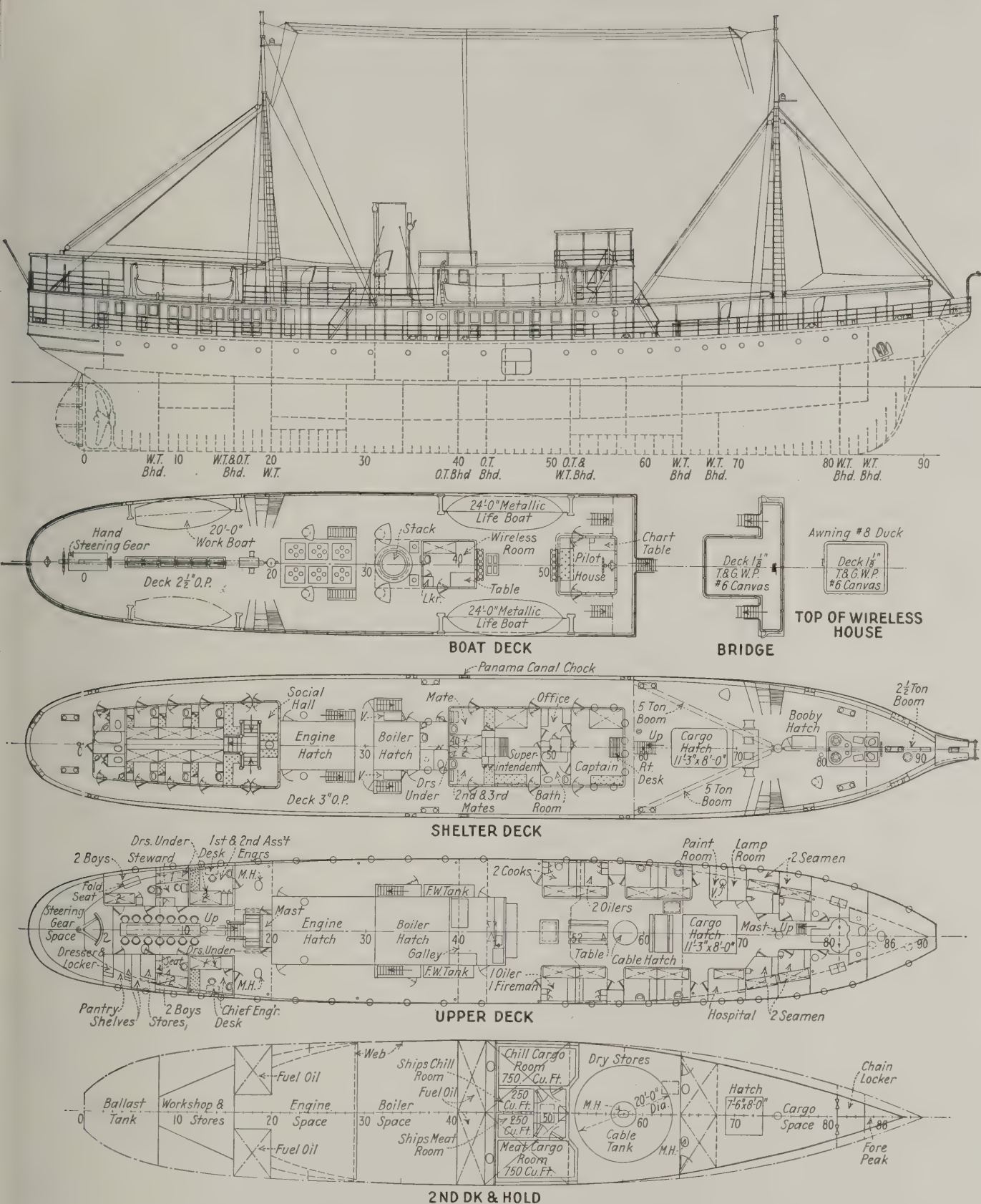
GENERAL ARRANGEMENT

The general arrangement is as follows: The machinery equipment, consisting of a triple expansion engine with cylinders 17 inches, 25 inches and 43 inches diameter and stroke of 30 inches, supplied with steam by two Scotch boilers 12 feet diameter and 11 feet long, is located slightly aft of amidships. Forward of the boiler space are the fuel oil bunkers, which are extremely large permitting an unusual steaming radius, there being in addition reserve fuel oil bunkers at the after end of the machinery space so that the ship may be properly trimmed in all conditions of loading. At the extreme after end of the vessel is an after peak tank, there being in addition a fore peak tank, as well as tankage for boiler feed and water ballast in the hold.

The rudder stock is carried straight up to the boat deck, with independent hand steering gear, the quadrant and the steam steering engine being located below deck.

Forward of the machinery space there is provided an unusually large cold storage compartment properly subdivided, forward of this again in the hold is a cable tank as well as provision for stowage of dry stores.

On the upper deck at the after end is the main dining saloon, as well as living quarters for the engineer, officers, steward and pantry attendants. Abreast the machinery space

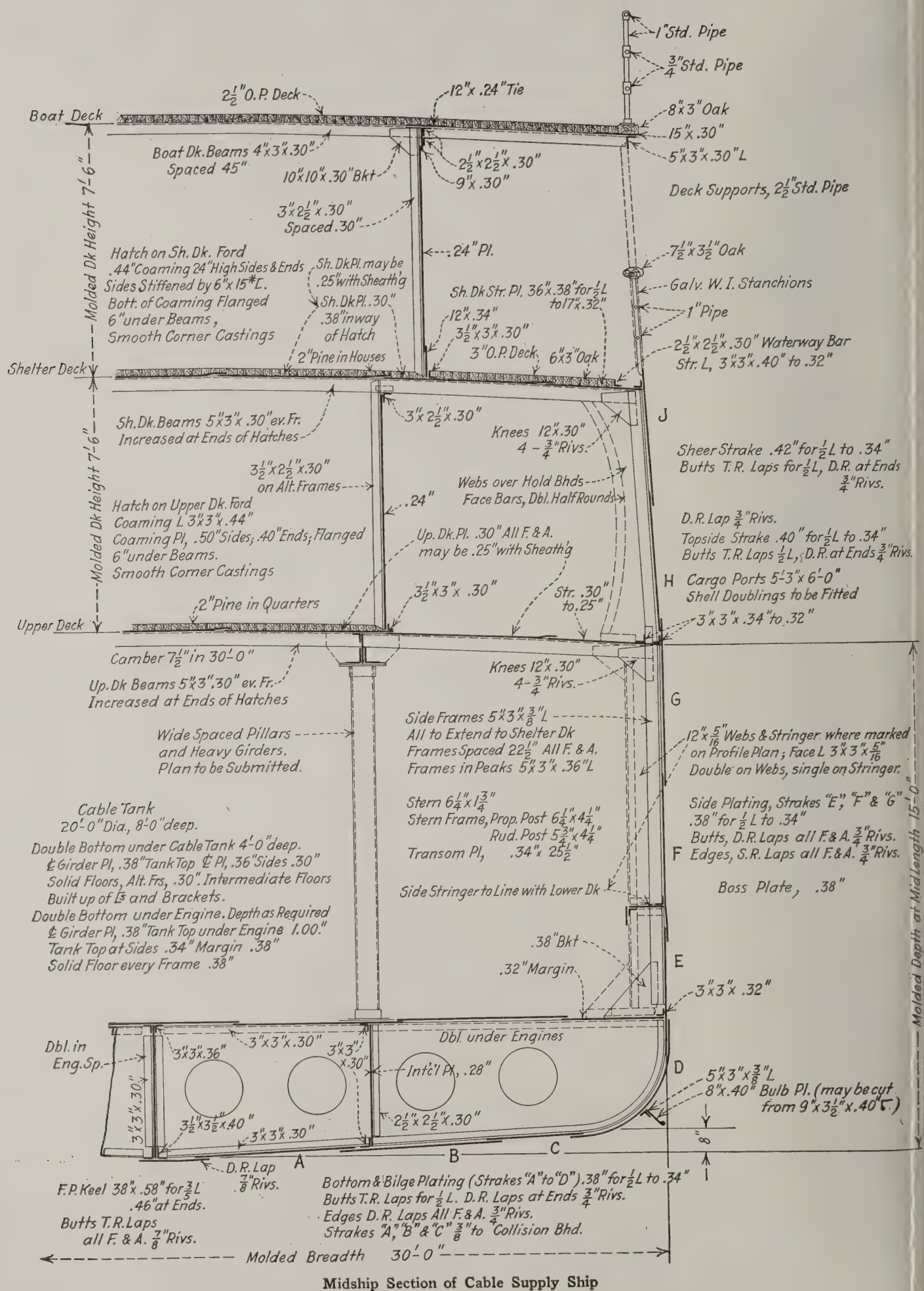


Profile and Deck Plans of Cable Supply Ship

on this deck there is a very considerable cargo space which can be served by two cargo side ports located about amidships. The space on the upper deck forward of amidships is laid out to provide living quarters for the crew, these being all in separate rooms, each having accommodations for two men, there being in addition ample facilities in the way of wash rooms, toilets, etc., as well as a hospital.

On the shelter deck there are two steel houses, the one aft of the machinery space containing a social hall and six double-bedded staterooms with necessary bathrooms for use of passengers. The house forward of the machinery space contains quarters for the captain and deck officers, as well as for the superintendent of the company.

On the boat deck there is at the forward end a pilot house



with sleeping accommodations for the pilot, and also a wireless room containing wireless apparatus and bunk for the wireless operator.

The specifications for this vessel are extremely complete and call for the most modern type of equipment and auxiliaries. The ice machine is of the York Manufacturing Company's make, operating on CO₂ gas with brine circulation. The oil burning equipment is of the Dahl type, which is used largely on the Pacific Coast and has proven extremely satisfactory.

The vessel will be heated throughout by steam and lighted by electricity, special attention being given to securing forced ventilation in quarters as well as the best possible system of natural ventilation.

Floating Dry Dock Navigated Carrying 13,000-Ton Vessel

ON November 11, at Chester, Pa., the oil tanker *J. N. Pew* while on the dry dock of the Sun Shipbuilding Company was very seriously damaged, by the explosion of oil gas while repairs were being made upon the tanks.

The accident resulted in the loss of life of one man and the injury of 18 others, and very seriously damaged the ship, so much so, that she could not be floated off the dry dock until very extensive repairs, including the removal of interior machinery and parts, were effected.

As this company has a large hammer head crane in connection with its shipbuilding plant, the question was raised as to whether it would be possible to move the ship and dock from the berth out into the Delaware River, tow the vessel and dock some little distance up stream and place them together under the derrick.

As the local underwriters were somewhat doubtful as to this unusual suggestion, the designer of the dry dock, William T. Donnelly, consulting engineer, New York, was called on the long distance telephone in New York, and unhesitatingly assumed all responsibility, with the result, as shown in the illustrations, that the dock and ship together handled by a fleet of seven tugs was moved under the crane and returned to its mooring without difficulty.

This is believed to be the first time that such a vessel as



Bringing Floating Dry Dock and Damaged Vessel Under Hammerhead Crane at the Sun Yard

large as 13,000 tons deadweight has been navigated on the deck of a floating dry dock.

It might be added, on the designer's authority, that the stability of ship and dock was very much greater than that of the ship when floating at her usual waterline.

SYSTEM FOR NUMBERING OF STEELS.—A system of designating kinds or qualities of steel by code numbers, each of which would represent a definite specification, will be developed as a result of a recent conference of the principal producers and users of steel held at Washington, D. C.; at the call of the American Engineering Standards Committee.

INSTITUTION OF NAVAL ARCHITECTS.—The spring meeting of the Institution of Naval Architects will be opened in London on Wednesday, March 21.



Floating Dry Dock Being Towed up the Delaware River with a 13,000-Ton Vessel on Board

Stern Wheel Western River Towboat Wacouta

Steel Hull Is Stayed by Girders Instead of Hog Chains—
Propulsion Is by Twin Tandem Compound Condensing Engines

By T. R. Tarn

THE stern wheel river towboat *Wacouta*, built for the Joyce-Watkins Company, by the Dravo Contracting Company, Pittsburgh, Pa., and designed by the firm of Cox & Stevens, New York, has just been delivered to her owners after a very satisfactory trial trip at Pittsburgh. The home port of the *Wacouta* will be Paducah, Ky. She will operate out of that place to tow railroad ties on the Cumberland and Tennessee Rivers.

The principal dimensions of the vessel are as follows:

Length overall	157 feet	4 $\frac{7}{8}$ inches
Length on deck	134 feet	5 $\frac{1}{8}$ inches
Beam, molded	28 feet	0 inches
Beam, overall	28 feet	8 $\frac{5}{8}$ inches
Depth, molded	5 feet	0 inches
Crown of deck		6 inches
Mean draft	47	inches

The design of this boat includes all of those features found on the boats operating in the Monongahela River pools with



Shallow Draft Ohio River Towboat Wacouta

such modifications as were necessary to adapt her to service on the Tennessee and Cumberland Rivers.

HULL CONSTRUCTION

The steel hull is of the girder type having a modified scow bow, designed so as to permit of carrying a large amount of fuel, in order to make a trip to Sheffield, Alabama, and return without refueling. This bow, like the ordinary scow bow, is very easy to plate and gives a substantial seating for the deck fittings and towing knees. The hull is strengthened longitudinally below deck by five trusses and transversely by five watertight bulkheads.

The steel deck on the forecastle and guards is covered with Oregon fir. The planksheer is white oak. In the way of the coal bunker and the boilers the deck is cemented.

Two main deck trusses seat directly over the wing trusses in the hull and continue aft to form the support of the wheel and transmit the stresses due to operation, in conjunction with the cylinder beams.

The cylinder beams are built of plates and angles with a single web and conform to the crown and sheer of the deck. At the after transom the long beams jog to the bottom of the transom to give a greater depth to the beam and facilitate in transferring the dynamic stresses into the hull.

Recesses are provided in the cylinder beams for the pillow blocks. The after ends are fitted with a jockey beam and the portions of the main deck trusses extending aft of the splash bulkhead are stiffened by struts connected to the center ridge stringer at the boiler deck.

The main deck house and the boiler deck are of steel construction. The sides of the house forward of the main engines are formed as a part of the main deck trusses. The side capstans are located in recesses built in the sides of the house. Provision has been made for coaling the bunker from fuel flats through side doors in the house as well as from chutes or cranes from overhead. A coaming extending around the head of the boat together with inboard coamings are fitted to carry coal on the boiler deck to supplement the main bunker supply.

All of the weather plating on the boiler deck is 3/16-inch thick. The plating inside of the quarters is No. 14 gage with 2-inch by 1 $\frac{3}{4}$ -inch nailing strips placed on every beam to receive $\frac{7}{8}$ -inch tongue and groove maple flooring.

The frame of the cabin and the hurricane deck are of wood construction. Siding panels of 5/16-inch "Neva-Split" material is used. The overhang of the hurricane deck is supported by 1 $\frac{1}{4}$ -inch galvanized pipe stanchions forming the boiler deck rail.

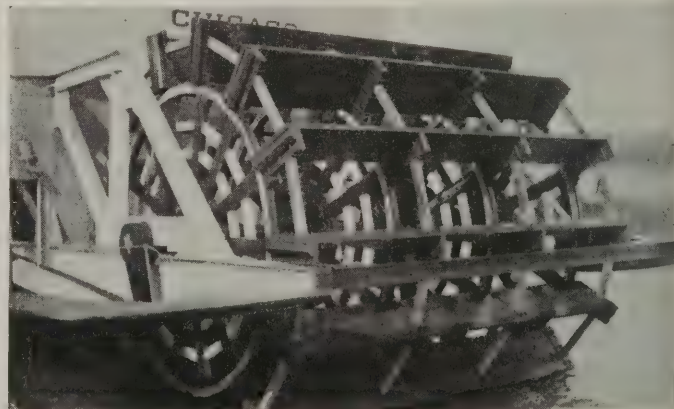
The pilot house is of steel construction, 12 feet by 15 feet in size. The after end extends over the entrance hall to the quarters forming a seat. The steering apparatus and other gear underneath the pilot house is enclosed by a bulkhead and the remaining space is an officers' wash room.

The officers' and crew's quarters are sheathed under the carlins with stamped metal ceiling. Ventilation is provided by means of transoms under deck, both inboard and outboard. Screen doors, transom sash screens, steam heat, hot and cold filtered water for the plumbing, running ice water for drinking purposes and electric lights have been provided.

PROPELLING MACHINERY

The propelling machinery is of the twin tandem compound condensing type with cylinders 12 inches by 26 inches by 6 feet stroke operating with a steam pressure of 200 pounds per square inch. The machinery was built by the James Rees and Sons Company, Pittsburgh, Pa. The valves on both the high and low pressure cylinders are of the balanced poppet type operated by an "inside cam" motion. The "Rees" adjustable cut-off is fitted to the high pressure cylinders. The low pressure cylinders operate full stroke at all times.

Steam reversing gear is fitted together with cylinders to raise the levers and do the necessary cushioning.



Radial Stern Paddle Wheel

The wheel is 18 feet in diameter by 18 feet long with 14 buckets each 30 inches wide. The wheel shaft is a solid nickel steel forging hexagonal in section $10\frac{1}{2}$ inches across the flats with 4 cast steel flanges secured to the shaft by wedges. The journals are 10 inches in diameter by 10 inches long. The cranks are open hearth steel forgings, machined all over, and shrunk on the shaft.

BOILERS

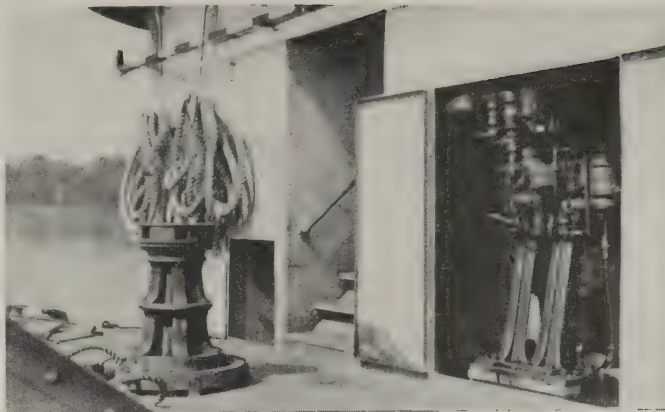
The boilers consist of three units in one battery, 40 inches in diameter by 24 feet long, each containing five 9-inch flues of lap welded tubing. They are arranged for burning coal, hand fired, with natural draft. They are equipped with Snowden heaters, Van Dusen water gages and steam jet blowers. The safety valves are of the spring loaded type with the vents carried to the top of the pilot house.

The auxiliary boiler located in the engine room is 48 inches in diameter by 7 feet high, designed for a steam pressure of 200 pounds per square inch.

AUXILIARIES

The condenser, built by Row & Davis, is circular in section of steel plate containing 900 square feet of cooling surface. The tubes are $\frac{3}{4}$ inch in diameter of Admiralty mixture, not tinned, No. 18 B. W. G. The discharge from the condenser is run to the ash pan and discharges through the ash well.

The air pump is an independent, vertical twin beam pump having the air cylinders 14 inches in diameter, steam cylinder



Bow Capstan and Capstan Engine

ing steam scavaging pipes and quick opening gate valves, both operated from the engine room, are fitted at the intakes.

The hot well is built of 3/16-inch steel plates, 4 feet long by $2\frac{1}{2}$ feet wide by 3 feet deep, divided into four compartments by baffle plates forming skimming and quieting chambers.

Two 24-inch cast iron, tandem, double combination sand and charcoal pressure filters of the Scaife type are installed as part of the plumbing system, together with a coagulating device for introducing alum into the water. In connection with the filters a softened water tank built of 3/16-inch steel plate is installed in the engine room to provide make-up feed water storage for the boilers. The level of the water in this tank is automatically maintained and is introduced into the feed water system ahead of the air pump.

A hot water heater of the Row & Davis "Paracoil" type is installed as part of the plumbing system. This heater is capable of heating 500 gallons per hour from exhaust steam at 6 pounds gage pressure. This heater is independent of the water back in the galley stove and hot water storage tank in the galley.

The steering gear is of the regular Western River ram type, 7 inches in diameter, installed under the boiler deck over the long tiller. The pilot wheel is 10 feet in diameter and the tiller lines $\frac{3}{4}$ inch in diameter.

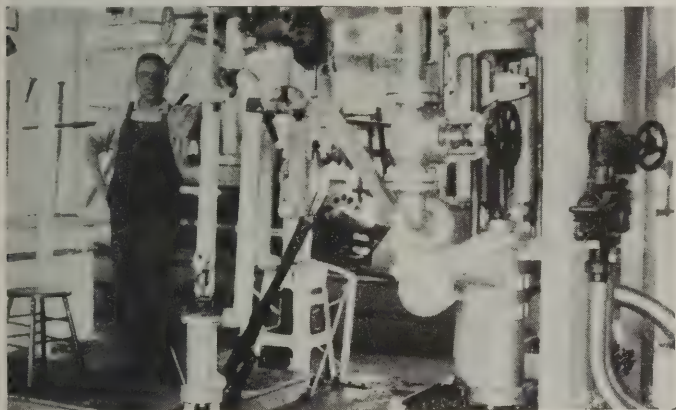
The electrical generating equipment consists of a 15 kilowatt, 125 volt, direct current Engberg unit, vertical enclosed engine direct connected to the generator, and a 1-kilowatt, 110-volt, direct current Moon turbine unit for standby service. An arc searchlight and a 1,000-watt nitrogen filled lamp projector, both controlled from the pilot house, are installed on the forward end of the boiler deck. At the splash bulkhead a "landing light" controlled from the pilot house is installed both port and starboard.

The steam capstan on the forecable is of the double drum, double purchase type with wood filled barrel operated by a double reversing 6-inch by 8-inch engine, located on the main deck. The side capstans have single cast iron barrels and are operated, single purchase, by double reversing 5-inch by 7-inch engines located below deck.

The refrigerating machine is of the direct expansion ammonia marine type having a capacity of one ton. The refrigerator, located on the boiler deck, contains a 40-pound ice-making set and a scuttle butt with drinking fountains located in the dining and engine rooms.

To comply with the Interstate Guarantee Regulations a "Polarstil" as manufactured by the Jewell Polar Company, having a capacity of 15 gallons per hour and a storage capacity of 200 gallons was installed.

The main steam line is $4\frac{1}{2}$ inches in diameter and the branch steam lines 3 inches in diameter. The main engine throttle is of the quick-opening type located under the boiler deck to eliminate the usual spring and branch pipe bends.



Operating Platform, Looking to Port

8 inches in diameter, all with a common stroke of 12 inches.

The circulating pump is of the centrifugal type with a side inlet, receiving its suction from the cold well. It is direct connected to a 6-inch by 6-inch vertical engine mounted on the same bed plate. The pump suction is 8 inches and the discharge 6 inches.

There are two boiler feed pumps of the vertical simplex extra heavy Worthington type with 5-inch water cylinders, $7\frac{1}{2}$ -inch steam cylinders, with a common stroke of 12 inches. These pumps are controlled by chronometer valves operated by a float in the hot well to maintain a constant level of water in the closed feed water system.

The sanitary pump is a horizontal duplex piston pump of the Worthington type with steam cylinders $5\frac{1}{4}$ inches in diameter, water cylinders $4\frac{3}{4}$ inches in diameter, with a common stroke of 5 inches.

The heater is of the Row & Davis, horizontal, steel shell, single pass, pressure type capable of heating 12,000 pounds of water when furnished with exhaust steam at 6 pounds back pressure.

The cold well is made of 3/16-inch copper, 30 inches in diameter, extending above the main deck. It is connected to combination cast brass shoes and strainers fitted to the side plating by 10-inch galvanized intake pipes. Quick open-

It is operated by means of levers and rods from a graduated quadrant on deck.

The auxiliary steam line is 3 inches in diameter, furnishing steam to the auxiliaries through a reducing valve at 125 pounds pressure.

Boiler pressure is used for the boiler feed pumps, injector, steering gear, whistle, portable syphons and the capstan engines. Auxiliary steam line pressure is used on all other units including the hull syphons.

Provision has been made at the forecastle for steam connections for attaching portable steam syphons for unwatering

lief valve is installed on this line as well as an atmospheric exhaust line to the paddle wheel for melting ice and to permit of operating the main engines non-condensing should occasion require.

OUTFIT, FITTINGS AND EQUIPMENT

The electrical installation includes plug receptacles for attaching portable hand lamps in the way of the boilers, machinery and wheel and outlets for fans and the electric iron in the laundry.

The plumbing fixtures are modern in every respect and were selected with the object of providing the crew with conveniences similar to those found ashore. All lavatories, sinks, tubs and showers are supplied with a plentiful supply of hot and cold filtered water with provision for supplying the same at all times.

Cast iron radiation is used for steam heating and is installed in the pilot house, all toilet rooms, the dining room and the forward and after cabin halls. The steam supply is taken from the main exhaust header ordinarily, with provision for using live steam if desired.

All bitts, chocks and cavils are of cast iron. The bitts are 8 inches in diameter. The chocks have 6-inch rollers and the quarter chocks and those in the way of the side capstans are tilted to give fair leads to the capstan barrels. Shackled fastenings for towing chains have been provided.

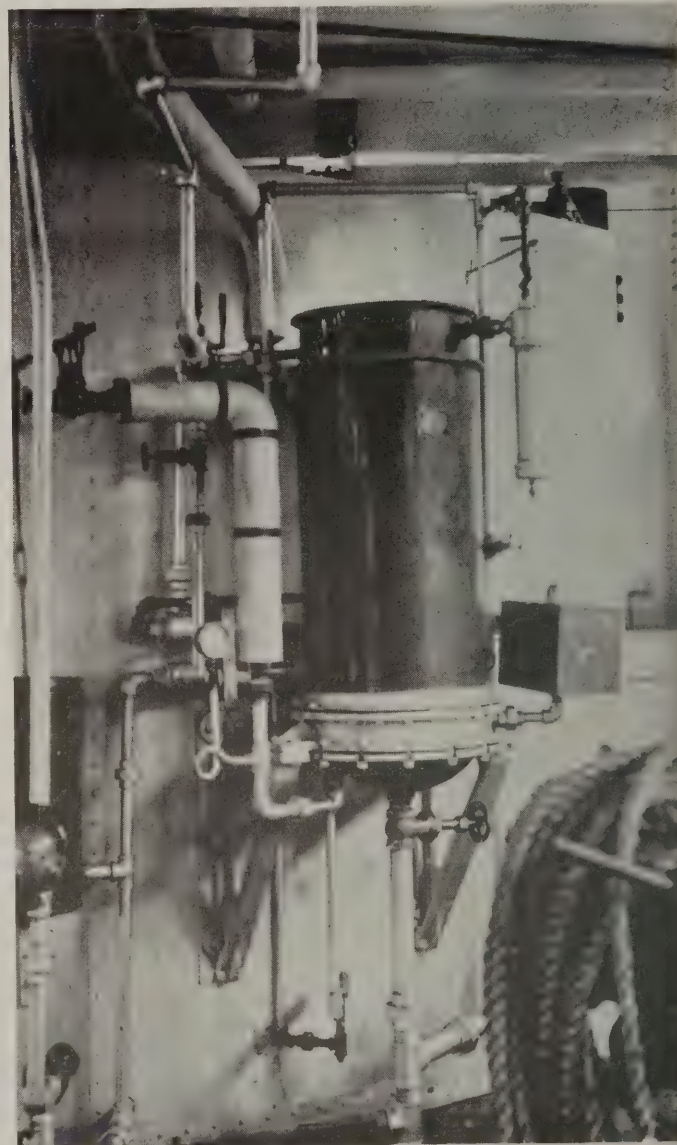


View Showing Hot Well Air Pump, Sanitary Pump and End of Condenser

the barges. Plug receptacles for attaching electric cables for use in connection with portable motor-driven centrifugal pumps have also been provided.

Mr. W. W. Watkins, general manager of the River Transportation Department of the Joyce-Watkins Company, has conducted a series of tests with several pumps of this type in order to effect a saving in the amount of raw river water required for make-up feed purposes. Unfortunately, an improved pump devised by Mr. Watkins was destroyed in the recent Chicago fire.

All of the auxiliaries in the engine room, as well as the capstan engines, exhaust into a common header. An automatic back pressure valve maintains a constant pressure of 6 pounds on this line and allows the surplus exhaust steam to enter the condenser. With this arrangement of piping the amount of make-up water for the boilers is minimized and a greater overall economy is obtained. An outboard re-



Distiller for Fresh Drinking Water

Two 16-foot wooden yawls are provided. Rollers made of 2-inch pipe are fitted at the guard and in the deck room to facilitate stowing the yawls in the deck room when desired.

The berths for the officers and crew are of white enamel steel pipe with wire springs secured in metal frames. A double berth has been fitted in the engine room aft of the tiller bulkhead for the firemen or for use as a spare berth.

The usual engine room signal bells are installed with a jingle bell in the firing alley, as well as a chestnut bell in the engine room. Cory and Sons system of engine telegraphs has been installed to supplement the above.

A combination oil and lamp locker is built in the deck room as part of the engine room bulkhead. This location does away with handling the oil in the engine room and confines a fire possibility to a more desirable place.

A very substantial locker built of steel has been provided for the engineer. A complete equipment of tools and spare parts has been provided to enable the engine room crew to make temporary or minor repairs.

Special attention has been given to the painting. The interior of the hull has been painted white in order to take as much advantage as possible of reflection. The interior of the main deck house and engine room have a finishing

coat of spar varnish. The machinery, in addition to the usual foundry filler, was given a heavy coat of lead and oil after erection and then varnished. Those parts subjected to high temperatures and not covered were given a coat of aluminum paint.

A recording pressure gage was installed on the main steam line and a recording temperature gage on the boiler feed line. A revolution counter was also installed.

The installation of superheaters was considered but the installation will not be made at present.

This machinery develops 450 indicated horsepower under ordinary service conditions when towing four wooden barges 135 feet by 26 feet when loaded to a draft of 7 feet when the river is at an ordinary stage.

The stresses in the hull structure were carefully determined by plotting the curves of weight, load, buoyancy and sheer in order to determine the maximum bending moment and its location, to effect as much saving in steel material as possible, consistent with a satisfactory fiber stress. This is a rather unusual procedure in river practice but a necessary one, especially in a shallow hull of this kind where the stresses are taken care of by trusses rather than by the usual method of hog-chaining.

Shipping Board Teaching Principles of Efficient and Economical Fuel Combustion at Navy Testing Plant

Great Competition Shown on Part of Engineers Taking Course to Obtain the Honors for Best CO₂ Readings

THE marine world has not appreciated the importance of high boiler efficiency to the same extent as have the operators of large sized stationary plants. On page 100 is given a chart showing the saving accomplished by applying stationary practice to several vessels which are representative types of the Shipping Board fleet.

The average CO₂ conditions that were found on the 13 vessels, as shown on the chart, gave 8.9 percent which shows a loss of fuel of over 6 percent. For example, if the 13 vessels had an average fuel consumption of 200 barrels per day with 150 steaming days per year, the saving would be \$36,000 in one year.

The Fuel Conservation Committee of the United States Shipping Board appreciates this situation and as part of its program has instituted the Fuel Oil School at the Philadelphia Navy Yard for engineer officers of the merchant marine. The school is located at the Fuel Oil Test Plant of the Philadelphia Navy Yard and is under the direct supervision of the Navy personnel Lieutenant Commander H. H. Norton is in charge and has very able assistants to help him carry out this work.

The Fuel Oil Test Plant is the best of its kind in the country. It has several different kinds of boilers and every means for obtaining the most complete data on steam boiler efficiencies.

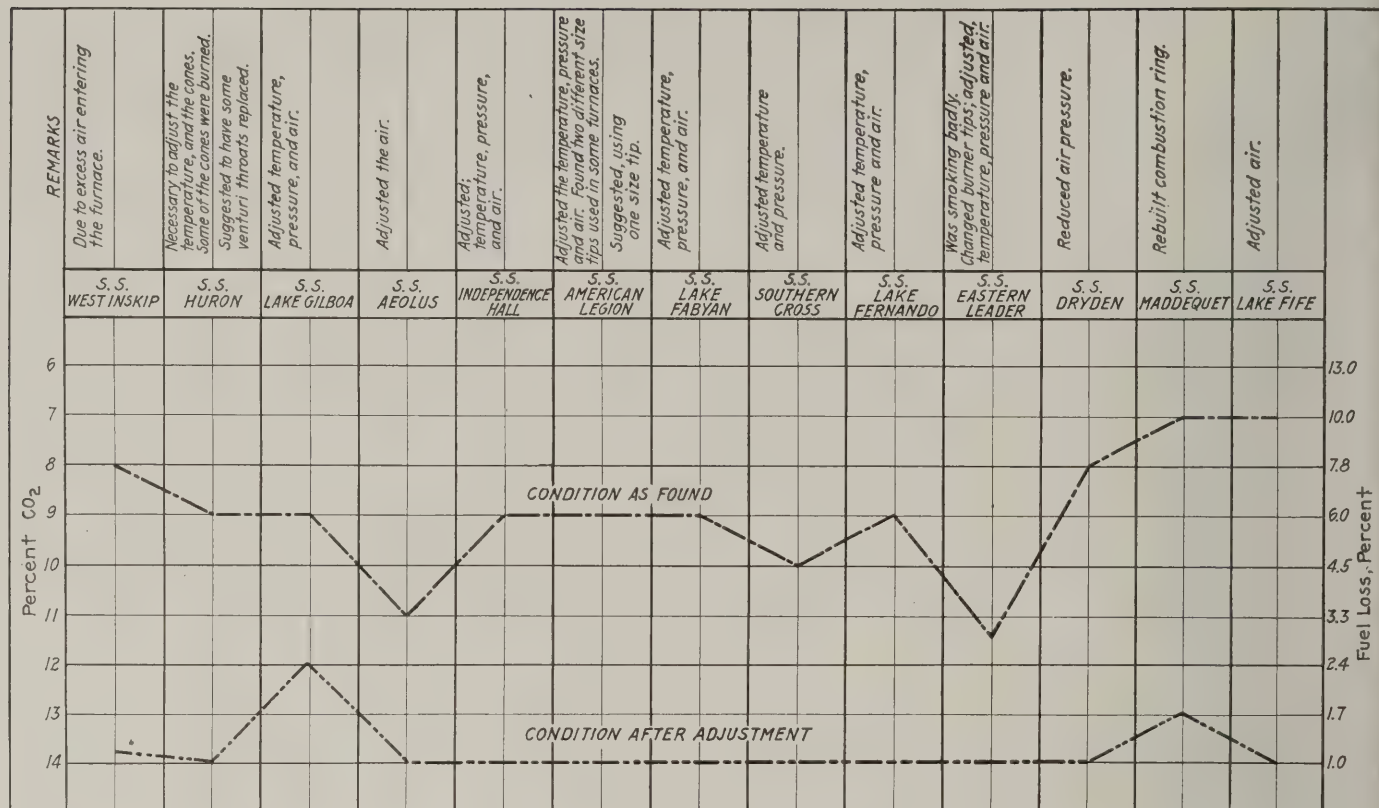
SUBJECTS COVERED

One of the subjects covered in this five-day course is the problem of combustion. In order to give the engineer the principles on which to work, a lecture is given by one of the instructors in the simplest and most practical way. The things touched on are the meaning of the word combustion, excess smoke, how to remedy it, the importance of reducing the excess air to a minimum, the proper temperature at which to burn the oil, the analysis of the oil, the chemical symbols and their relation to each other.

Different types of flue gas analyzers are explained and how the chemicals are mixed to obtain the proper absorption of flue gas. At the beginning of the afternoon session, the class is assembled in the laboratory where the men are divided so that each man will have a partner and each team is given a flue gas analyzer and enough solution to make a complete charge so that each team fills its own machine



Babcock & Wilcox Boiler Equipped with Four Types of Oil Burners



Combustion Report, Tests Made on United States Shipping Board Oil Burning Vessels

ready for a test of gas. When all machines are ready for use, the class is assembled in the test plant, each team has a connection on the boiler from the uptake from where the samples of the flue gas is to be taken for analysis.

The picture shows a Babcock and Wilcox boiler with four different types of oil burners used in the merchant service. The boiler under operation is taken care of by one of the instructors who does the adjusting to the oil burners in such a way as to give a low efficiency. It is the duty of every man to readjust the burner to the best of his ability. The boilers have peep holes on all sides and with colored glasses, a man can see just how the flame is performing in the furnace. After he is satisfied that he has the best possible adjustment, he takes an analysis of the gas. Great competition takes place in this part of the course to see who takes the honors for the highest CO₂ readings. It may be stated that the percentages of CO₂ readings run between 13 and 14 percent in most of the classes at the school.

All-Steel Power Press Brake

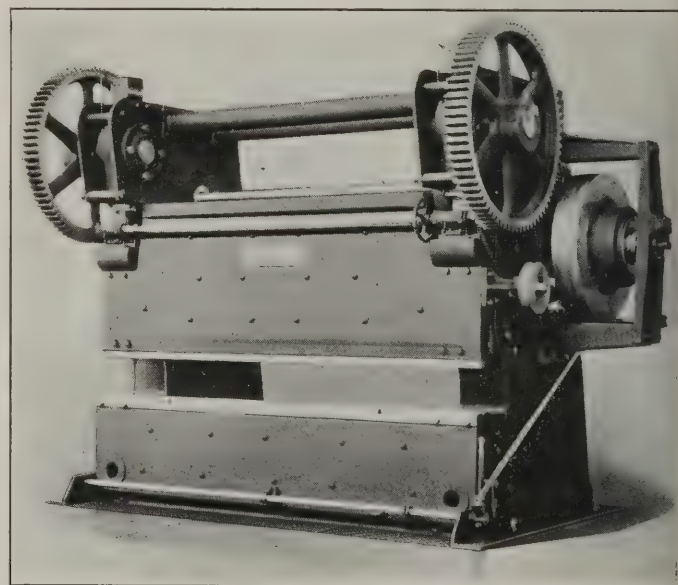
A NEW development in the manufacture of heavy brakes has been made by the Cincinnati Shaper Company, Cincinnati, O., with the introduction of the Cincinnati all-steel press brake. This line of brakes has been designed with an open side in order to facilitate the handling of material. As most bends are made near the edge of the plate, the full length of the die-holding surface can be utilized. Thus, for most classes of work, a machine can be rated with respect to the length of the die-holding surface instead of the distance between housings, which means the use of a narrower, more rigid machine, and a saving in cost and floor space.

The bed and ram are constructed entirely of heavy steel plates and billets, which, together with cross ribs, are welded to each other, thus making what is virtually a heavy solid steel beam of box section with the metal placed to the best advantage. The housings are framed in steel plate, having

cast steel members interlocked and welded to the plates. All the revolving parts run in a bath of oil.

To meet the demand for increased production these machines have been designed to operate at a greater number of strokes per minute than has been customary in brakes heretofore. The fly wheel is mounted on high duty ball bearings having hardened steel inner and outer races. The clutch is of the multiple disk type, especially designed and developed for this particular tool and operated in oil.

These brakes are built in capacities ranging from 80 to 600 tons for working material from 10 gage to $\frac{3}{4}$ inch in thickness. The widths between housings are 6 feet 6 inches to 14 feet 6 inches; the weights 18,000 pounds to 120,000 pounds.



Cincinnati Power Press Brake with Multiple Disc Clutch

Regulations for Fire Prevention Aboard Ship

National Fire Protection Association Adopts Rules Governing Fire Hazards in the Construction and Maintenance of Vessels

THE following rules governing methods to be adopted in ship construction and maintenance for preventing the possibility of fire on board ship were prepared by the Committee on Marine Fire Hazards of the National Fire Protection Association and adopted at the recent annual convention of the association:

Throughout the following, where the word "approved" is used in designating type, construction, etc., it refers to the approval of the Inspection Department and Classification Societies having jurisdiction. No provision in these regulations is to be retroactive as regards construction.

Construction

ARTICLE I. BOILERS

1. *Lagging.* All boilers, including steam domes, shall be thoroughly covered with asbestos or other approved heat-insulating material; such covering to extend down sides below the line of grate bars. However, vertical or donkey boilers need not be covered provided all woodwork within 18 inches at sides or within 2 feet 6 inches of uptakes or breeching is covered with sheet metal over sheet asbestos.

Note: Vessels having boiler houses with steel sides, ends, and roof, will not be required to have boilers covered.

2. *Floors.* All fire-room floors shall be covered with iron plate or at least 2 inches of cement, or other approved material. At least $\frac{3}{4}$ -inch asbestos board or 1-inch plastic asbestos or equivalent shall be laid over all woodwork under a fire-room floor.

3. *Foundations.* The floor under the grate bars of all externally fired or leg boilers shall be of brick or cement at least 6 inches thick, vented by the insertion of old tubing laid horizontally, or its equivalent, under which shall be at least $\frac{3}{4}$ -inch asbestos board or $1\frac{1}{2}$ -inch plastic asbestos or equivalent covered with sheet metal. The floor under vertical boilers, if laid on a wood deck, shall be of brick or cement or other approved material, similarly vented, at least $2\frac{1}{2}$ inches thick, extending out in front at least 3 feet; or, if less, shall have a fire-resistive coaming around said floor projecting at least $2\frac{1}{2}$ inches above it, or be covered by a metal pan with projecting edges. On all such floors, under the brick or cement there shall be at least $\frac{3}{4}$ -inch board or 1-inch plastic asbestos or equivalent covered with sheet metal.

4. *In Way.* Where coal and wood, or stores, or cargo of any description, except oil, are carried or may be carried alongside of boilers, a partition shall be built at least 4 inches clear, to prevent anything being placed next to the boilers; and under no circumstances may anything be placed between such partitions and the boilers. If anything is or may be carried near the back ends of boilers, similar partitions or bulkheads are to be fitted, but these shall be at least 2 feet distant from boilers, and space between them and boiler kept clear and clean. Under no circumstances may a wood platform, locker or grating be fitted over top of any boiler nearer than 12 inches, and no lines, clothes, or other combustible articles be laid over or alongside of boilers.

5. *Ash Guards.* A steel coaming at least 12 inches high shall extend from the front of all boilers to side partitions to prevent coal or ashes getting into wings.

6. *Drip Pans.* Where oil is used for fuel, on leg or externally fired boilers there shall be a drip-pan of heavy iron under the fire boxes to catch all drip. Where wood is used for fuel, a water pan shall be fitted under the grates, and a partition or metal screen erected to prevent cinders or sparks being blown into the woodpiles. In no case may the wood be stacked against the boiler.

7. *Casings.* The construction of the house or casing over and around the boiler should be of such nature that hot air or gases cannot be pocketed at any high point; but if such exist, suitable vent louvers shall be cut in sides of house or casings to provide a circulation of air.

8. *Bulkheads.* Screen bulkheads between fire room and engine room should, where possible, extend down to the tank top or shell of the vessel in order to form a fire wall between engine room and fire room bilges. Where oil burning equipment is installed, these bulkheads should be made oil-tight to at least two feet above the tank top and bilges to prevent any oil reaching the engine room bilges and tank top.

ARTICLE II. STACKS

9. *In Way.* Where a smoke stack passes through a wood deck, the woodwork should be cut away at least 12 inches from the stack and the wood faced with a metal collar over sheet asbestos; but where the construction of the vessel will not permit a space of 12 inches, there shall be an opening at least 4 inches wide around stack; this opening to be completely faced with a metal collar extending at least 6 inches above roof and 6 inches below same, and the carlins and roof on under side around opening, covered with sheet iron extending back radially at least two feet. Sheet asbestos at least $\frac{1}{8}$ inch thick shall be placed under all metal.

10. *Umbrellas.* The bottom of the flange of the umbrella around stack shall be higher than the top of the flange around the opening in the deck, leaving a clear horizontal space for the escape of the gases or else a perforated coaming shall be used.

11. *Wood Burners.* The stacks of all vessels using wood for fuel shall be fitted with spark arresters.

ARTICLE III. STEAM PIPES

12. *Lagging and Clearances.* All main and auxiliary steam pipe lines shall be thoroughly covered with asbestos or other approved material if within six inches of woodwork; and where such steam pipes pass through woodwork, they shall be fitted with a proper metal collar and the woodwork cut away or protected in an efficient manner.

ARTICLE IV. BUNKERS AND HOLDS FOR COAL

13. *Vents.* Ventilation of all hold, wing, and 'tween-deck bunkers shall be provided for by pipes or trunks leading to outside atmosphere.

14. *Temperature Testing.* Reserve bunkers and holds shall be provided with sounding trunks so that internal temperatures may be read as required.

ARTICLE V. BUNKERS AND TANKS FOR OIL

15. *General.* The storage of oil shall be restricted to cellular double bottom, hold, deep, peak, bunker, settling and other tanks specially constructed for this purpose. These compartments and tanks shall be fitted with approved bulkheads, sub-divisions or swash plates. They shall be so strengthened as to satisfactorily withstand the stresses brought upon them in a sea-way when partially filled; and if separate from the hull, shall be properly braced and secured thereto by chocks or clips riveted to both tank and foundation. The scantlings and riveting shall be in accordance with the requirements of the American Bureau of Shipping, or approved equivalent, for vessels and tanks carrying oil in bulk.

16. *Location.* Fuel tanks should not be located on deck; but if such an arrangement is necessary, the installation must be approved.

In order to avoid as far as possible uncontrollable flooding in event of accident; the amount of piping under static head of fuel oil should be reduced to a minimum consistent with the design of the system.

17. *On Wooden Vessels.* On wooden vessels a lead lining shall be placed under tanks which are separate from the hull. Lining shall be not less than 8 pounds per square foot, laid over a coaming at least 6 inches high and drained to a sump fitted with independent stripping suction at the lowest point. These tanks shall be not less than 18 inches from boilers at all points except the back where they shall be at least 24 inches distant.

18. *Tests.* All oil storage compartments and tanks shall be tested by a head of water in accordance with the requirements of the American Bureau of Shipping or approved equivalent.

19. *Painting.* All oil tanks, compartments, and bunkers shall be thoroughly coated on the outside with a suitable non-flammable and rust-resisting material.

20. *Vents.* An independent, permanently open, iron vent pipe terminating in a goose neck or approved automatic valve in the open air and above the upper deck shall be provided for every oil tank, compartment or bunker. Vent openings shall be screened (40 by 40 non-corrodible mesh) and of sufficient freeing area to permit unrestricted inflow of liquid during the filling operation (in no case less than two inches in diameter) and accessible for examination and removal.

Vents shall terminate well above the top of the fill pipe; or, if tight connection to the tank is made in the filling line, at a point one foot above the level of the top of the highest reservoir from which the tanks may be filled and never less than 3 feet, measured horizontally and vertically, from any porthole, window or other similar opening.

21. *Fill Pipes.* On tankers, fill pipe deck terminals shall be kept closed when not in use; and on other oil burning vessels, they shall be so designed as to make access difficult by unauthorized persons.

22. *Manholes and Hatches.* Manhole and hatch covers of oil tanks on all vessels shall be designed to fasten securely; and on oil burning cargo or passenger vessels shall be bolted, dogged or locked, and labeled or painted a distinctive color designating them as openings to oil tanks.

23. *Drainage.* Adequate means shall be provided by wells or gutter-ways and sparring or lining, to prevent any leakage from the fuel oil compartments coming into contact with cargo and to ensure that any such leakage shall have free drainage into the limbers or wells. In machinery spaces, such leakage shall be confined by gutter-ways to bilge cofferdam spaces next to tank bulkheads; and these spaces shall be drained independent of the main bilges by stripping suction to a suitable pump.

24. *Double Bottoms.* If double bottoms under holds are used for carrying oil fuels, the ceiling shall be laid on transverse battens, having at least a two-inch air space between the ceiling and tank top and permitting free drainage from tank top into the limbers. The method of venting this space shall be subject to approval.

25. *In Way.* A clearance between oil tanks and boilers, boiler casings and breechings of not less than 24 inches at the back ends of boilers and 18 inches elsewhere shall be arranged; and all structures giving off heat shall be effectively insulated if within 18 inches of any oil tank or compartment.

26. *Cofferdams.* The practice of constructing a cofferdam between deep fuel tanks and cargo tanks or storage compartments is recommended for all oil burning steam vessels. Such construction is considered unnecessary on motor vessels using fuel other than gasoline. On steam vessels burning oil of a flash point lower than 150 degrees F., closed cup, there shall also be a cofferdam between fuel bunker and fire-room compartment. The space enclosed by cofferdams shall be vented in accordance with the provisions of section 20.

ARTICLE VI. OIL BURNING AND HEATING SYSTEMS

27. *General.* It is strongly recommended that systems whereby oil is pumped from tank to the burners be used; but in cases where pumping system is deemed impracticable and the use of gravity feed is desired, special permission shall be obtained for installation and detailed plans submitted and approved.

Pumps shall be in duplicate, of an approved design, well secured against leaks under a test pressure 50 per cent in excess of the designed pressure of the system carried.

Whether pumps are located inside or outside of the fire-room, gear shall be installed for operation from deck of stop valves on each tank and throttle valves on both service and booster pumps. This provision does not apply to fuel pumps on motor vessels.

On steam vessels burning oil of a flash point lower than 150 degrees F., closed cup, the pumps handling such oil shall be located in a compartment separated from the rest of the machinery space by gas-tight bulkheads and accessible therefrom only by a gas-tight door.

The piping and spindles of fire-room controls shall be made gas-tight where they pass through the pump room bulkheads.

This pump room shall be provided with induced ventilation always sufficient to reduce the pressure therein slightly below that in the compartment from which entry is made. The provision of section 20 shall also be observed.

28. *Oil Level Indicating Devices.* Devices for ascertaining or indicating the oil level in storage and service tanks shall be provided. Use of gage glasses is prohibited except on motor vessels using fuel other than gasoline. Sounding pipes and spring loaded trycocks normally closed are approved. It is recommended that, where practical, a compression chamber connected by air piping to a mercury gage be installed, with gage and annunciator mounted on a board to indicate and signal audibly when the contents of each tank reaches a predetermined level. Other methods of meeting this provision are subject to approval.

29. *Heating of Tanks.* Where it is necessary to heat oil in storage tanks in order to handle it, the heating shall be done by means of properly installed coils or other approved system using only steam or water. Thermostatic control and thermometer are recommended for all heating devices.

30. *Heaters, Other Than Those for Tanks.* Heaters shall be of substantial construction with oil-tight joint. Only steam, water or approved electric device may be used for heating. A $\frac{1}{2}$ -inch relief valve, set at 400 pounds per square inch and discharging to the suction line or tank shall be fitted on the oil side of all heaters to prevent the accumulation of excess pressure when the heater is shut down, due to expansion of the oil caused by leaky steam supply valve or failure to shut off the steam supply.

31. *Burners and Air Registers.* Drip pans shall be fitted under each burner. Air registers should include provisions for the inspection of burner tips while register is in use. Registers should permit ready adjustment in area of air openings.

Burners shall be fitted in the registers so that they may be shut off, readily removed, or cleaned independently of each other.

ARTICLE VII. FUEL OIL PIPING AND FITTINGS

32. *Tank Piping.* A piping system for fuel oil storage tanks separate and distinct from other piping in the vessel is recommended; but an interchangeable system providing a method which precludes the possibility of a mixture of ballast water and oil may be used subject to approval.

33. *Type and Material.* All piping and fittings comprising the fuel oil system between pumps and burners shall be of the extra heavy type. Seamless drawn pipe is recommended for all pressure lines, but in installations burning oil of a flash point lower than 150 degrees F., closed cup, such piping shall be seamless drawn. No pipe less than $\frac{3}{8}$ inch internal diameter may be used. Unions, if used in place of right and left couplings, shall be of an approved type.

34. *Installations.* All piping shall be run as directly as possible without sags and so installed that, where possible, pipes pitch toward supply tanks without traps, and provisions shall be made for expansion, contraction, jarring and vibration.

35. *Test.* Oil piping between pumps and burners shall be tested and proven tight at a pressure of not less than 500 pounds per square inch. All joints and fittings in the pressure piping shall be kept oil-tight under service conditions.

36. *Protection.* Piping shall be exposed to sight wherever possible to insure prompt detection of leaks, and shall be protected against mechanical injury in an approved manner.

Pipes extending above the floor, particularly risers to furnaces, shall be effectively cased or jacketed to prevent loosening or breakage.

Fill and vent pipes shall be protected in an approved manner against mechanical injury.

37. *Valves.* All valves shall be of an approved type. Shut-off valves shall be located as follows: On both sides of any strainers installed in pipe lines; in discharge and suction lines at the pumps; in discharge and suction lines to any tank, directly on the tank; and in branch lines to burners.

A pressure relief valve shall be installed in the discharge line to burners and so arranged as to return surplus oil to the suction line.

38. *Strainers.* Duplex strainers shall be fitted in the suction of both booster and fuel oil service pumps; provided, however, that if booster pumps are used to deliver oil to the suction of the service pumps, the strainers need be fitted only in the booster suction. Strainers shall be so designed that one side can be cut out for cleaning while the other is the service.

ARTICLE VIII. LIGHTING

39. *Lamp Rooms.* All wooden oil and lamp rooms or lockers shall be completely lined with sheet metal nailed over asbestos at least $\frac{1}{4}$ inch thick, and nailing protected in accordance with National Fire Protection Association standard for fire door construction. No openings except doors or covers will be permitted.

40. *Oil Lights.* All oil lamps shall have metal bodies and, except hand lanterns, shall be kept in brackets well secured or suspended and stayed. They shall be secured in the brackets by an approved device for holding them in place, and shall have metal shields over them. Hand lanterns when suspended shall be secured by clips. It is recommended that solidified fuel, being safer and smokeless, be used in lamps, where possible.

41. *Electric Lights.* On all vessels using electric lights, the wiring for same shall be run in armored cable or metal conduit in the following locations: In holds, in engine and boiler rooms, in bunkers, in cargo spaces or other places where cargo is carried, and where wiring is run outside. Switchboards, fixtures, wiring and all other electric apparatus shall be installed in accordance with the rules of the National Electric Code.

Note: The "Recommended Practice for Electrical Installations on Shipboard," issued by the American Institute of Electrical Engineers is recommended as a guide for electrical installations. This is consistent with the requirements of the National Electrical Code and goes more into detail both with regard to good practice as affecting fire hazards, and also with regard to many other questions of installation, maintenance and operation having bearing on durability and safety on vessels.

ARTICLE IX. GALLEY AND HEATING

42. *Ranges.* The galley range shall be securely fastened to the deck, at least 1 inch air space or approved equivalent insulation being provided between the bottom of range and deck; and, if galley floor is wood, range shall have metal under it extending out in front at least two feet. If range is within 18 inches of a wooden bulkhead, such bulkhead shall be covered with sheet metal over asbestos at least $\frac{1}{4}$ inch thick. All smoke-pipes or stacks passing through wooden bulkheads or partitions shall be fitted with a proper metal collar and have woodwork cut away. Galley ranges shall have metal hood over them or have the ceiling protected with sheet metal over asbestos at least $\frac{3}{8}$ inch thick. No wooden warming racks over stoves will be permitted.

43. *Steam Heat.* A complete steam-heating plant on steam vessels is recommended. All steam-heating pipes and radiators shall be kept clear of woodwork. Where radiators are adjacent thereto, a metal shield shall be fitted behind each with $\frac{1}{4}$ inch air space between shield and woodwork.

44. *Stoves.* The use of stoves is discouraged; but where used, they shall be securely fastened to the deck, at least 1 inch air space being provided between bottom of stove and deck; and shall have sheet metal on the floor under them extending out on all sides at least 12 inches. If stove is within

18 inches of a wooden bulkhead, such bulkhead shall be protected with sheet metal over asbestos at least $\frac{1}{4}$ inch thick. All smokepipes or stacks passing through wooden bulkheads or partitions shall be fitted with proper metal collars and have woodwork cut away; and all woodwork within 8 inches of smokepipe shall be protected with sheet metal over asbestos at least $\frac{1}{4}$ inch thick.

Appliances

ARTICLE I. GENERAL

45. In addition to fire fighting equipment required by rules of United States Steamboat-Inspection Service, it is recommended that small gear such as smoke helmets, life lines, slickers, and gloves, be provided and kept in approved convenient places.

ARTICLE II. HOSE AND COUPLINGS

46. Hose shall be of an approved type. All hose couplings and fittings shall be in accordance with national standard of the National Fire Protection Association.

ARTICLE III. SPRINKLERS

47. *Features of Design.* To improve and encourage the use of sprinkler fire protection aboard ship, it is recommended that the following features be incorporated in any system.

The system and apparatus should be as simple and inexpensive as possible; and, so far as applicable to marine work, should comply in detail with regulations of the National Fire Protection Association.

The design should be such that it would operate only in case of fire, and not subject the ship or its contents to consequential damage due either to freezing, accidental operation, breakage or to any causes other than fire. To this end, the sprinkler pipes should preferably be empty and under atmospheric pressure; but served by fire pumps of ample capacity. The control should be dual, both manual and automatic; but it is recommended that the automatic feature be attained only through the use of a thermostatic control or other system which would prevent release of water except in the presence of heat.

48. *Location.* Automatic sprinkler equipment is recommended in cabin, store, crew and passenger spaces; and optionally, in cargo and machinery spaces, owing to the usual impracticability of stowing cargo or arranging machinery to all proper distribution of a sprinkler equipment.

ARTICLE IV. SMOTHERING DEVICES

49. *Steam Jets.* Steam jets controlled by master valves in accessible location are considered a satisfactory means of fighting fires in the cargo spaces of a vessel in the present stage of development of extinguishing apparatus. The size and number of steam smothering pipes called for herein are based on a steam pressure of 100 pounds. These sizes are suitable for higher pressure than 100 pounds, but for lower pressure they should be proportionately increased.

(a) Each compartment shall have a branch with steam jets of sufficient size to fill it in not more than fifteen (15) minutes.

(b) The main supply pipe from boilers on steam line shall be of sufficient size to supply 50 percent of the total volume of all the cargo spaces at one time.

(c) Main supply line on deck, running forward and aft, shall be of equal area at any point to the combined area of the branches taken from same, but at no point need its area be in excess of the main supply from machinery space of 50 percent of the area of all the branches in the vessel.

(d) The orifice area of the steam jets supplied by any branch pipe shall be at least equal to the cross sectional area of such pipe; that is, the end of the pipe may be left open, or it may be closed and a number of openings made in the pipe, the combined area of which shall be at least equal in area to the open end of the pipe.

(e) Maximum size of branch steam pipe to any cargo compartment shall be one and one-half inches ($1\frac{1}{2}$ inches) nominal diameter.

(f) Cargo spaces requiring more steam than would be supplied by a one and one-half inch ($1\frac{1}{2}$ inch) pipe shall have additional branch pipes and steam jets.

(g) Minimum size of branch pipe to any cargo compartment shall be one inch (1 inch) nominal diameter.

(h) Minimum size of branch pipe to lamp rooms, paint lockers, etc., shall be three-quarters inch ($\frac{3}{4}$ inch) nominal diameter.

Where

L—Length of compartment, in feet.

B—Breadth of compartment, mean, in feet.

H—Depth of compartment, mean, in feet.

D—Diameter of pipe required, in inches.

Then

$$D^2 = \frac{L \times B \times H}{30,000}$$

Or in accordance with the following table:

Values of $L \times B \times H$	Connection No. of Inlets	Size of Inlets Inside Diameter, Inches
30,000	1	1
46,000	1	$1\frac{1}{4}$
67,000	1	$1\frac{1}{2}$
94,000	2	$1\frac{1}{4}$
135,000	2	$1\frac{1}{2}$
203,000	3	$1\frac{1}{2}$

Size of main steam pipe

$$D^2 = \frac{\text{Summation of all } (L \times B \times H)}{60,000}$$

50. *Gas.* The use of inert gas, such as carbon dioxide for extinguishing or preventing fire may be applied to holds, bunkers, and other closed compartments not normally accessible to crew or passengers; but, on account of danger to life, the use of gas of this character shall be restricted to such spaces. On motor vessels and those equipped with insufficient boiler capacity to permit effective application of steam smothering, the installation of a gas system, subject to the foregoing restrictions, is recommended.

ARTICLE V. FIRE ROOM APPARATUS

51. *On Coal or Wood Burners.* In addition to regularly prescribed hose and extinguishers in each fire room; steam fire hose, coupled to the injectors and of sufficient length to reach all parts of fire room, should be provided.

52. *On Oil Burners.* In fire rooms with oil burning boilers a sufficient number of 2½-gallon foam-type chemical fire extinguishers shall be provided; and a box of dry sand with a scoop may also be supplied. It is also recommended that an extinguishing system be piped to inaccessible parts of fire room, such as under boilers and floor plates and in bilges. A foam or steam-smothering installation is approved for this purpose. Either an automatic or manual system or a combination of both may be used, but control of all manual systems should be from both inside and outside of the fire and engine room spaces. The type, number and location of extinguishers and layout of pipe lines and nozzles shall be subject to approval.

ARTICLE VI. EXTINGUISHERS

53. *General.* Hand chemical extinguishers should be distributed through all parts of the vessel accessible to crew or passengers, and the selection and distribution governed by the regulations of the National Fire Protection Association Committee on Field Practice. All extinguishers should be of types approved by the United States Steamboat-Inspection Service, and on the list of inspected mechanical appliances issued by the Underwriters' Laboratories.

ARTICLE VII. DETECTION AND ALARM

54. *General.* It is recommended that on passenger and cargo vessels, except tankers, pipes for detection of smoke or fumes be led from holds, bunkers and inaccessible parts liable to fires, to the bridge, engine room or other points where they may be readily observed; and that vessel be equipped throughout with a fire alarm system approved as to type and installation.

Operation

ARTICLE I. GENERAL REQUIREMENTS

55. In addition to the United States Government rules as to operation, quarters, stowage and packing of hazardous cargoes, etc., the following are recommended or required as noted:

ARTICLE II. DRILLS AND QUARTERS

56. It is recommended that certain members of the crew be designated as fire wardens and trained to special duties, such as use of smoke helmets and extinguishing apparatus, life saving, etc.; and that some form of compensation or privilege be accorded the men so designated.

ARTICLE III. CARE OF COAL BUNKERS

57. Care shall be taken that all vents are clear when bunkering is completed. In case of vessels having wooden bunkers using soft coal for fuel, same shall be thoroughly cleaned out at least once every sixty days while vessel is in commission. The coal bunkers of all vessels shall be cleaned on going out of commission or being laid up for over sixty days, making sure that all coal dust and rubbish are removed. Special care shall be taken in cleaning shelf pieces.

ARTICLE IV. PAINTING

58. Care shall be taken to ventilate, so far as possible, all confined spaces where paint containing inflammable ingredients is being used or stored, and naked lights in such spaces are prohibited. Paint lockers shall not be located in close proximity to boilers or stacks.

ARTICLE V. FUEL OIL REQUIREMENTS

59. *Flash Point.* These regulations are intended to apply generally to those oil burning equipments using only liquids having a flash point above 150 degrees F., closed cup tester; however, the necessity, under certain conditions, of burning fuel oil of lower flash than this point is recognized and additional requirements for the use of such oils are noted in sections 26, 27, 33 and 78 of these regulations. No untopped oil shall be used for fuel except in accordance with these additional precautions.

60. *Flash Test.* In determining the flash point, either Elliott, Abel, Abelpensky or Tag closed testers shall be used, but the Tag closed testers (standardized by the United States Bureau of Standards) shall be authoritative in case of dispute. All tests shall be made in accordance with the methods of tests as adopted by the American Society for Testing Materials.

ARTICLE VI. LOADING AND BUNKERING OF OIL

61. *Preliminary.* Before commencing to load oil, all signal bells, gongs, etc., shall be tested to insure working condition.

62. *Oil Hose.* Hose used for filling or discharging shall be of the flexible metallic type equipped with oil tight flanged joints or some other approved coupling device for the purpose of preventing rupture of connections. The inner metallic lining of such hose shall be effectively grounded against possible charge of induced electricity.

63. *Hatches and Manholes.* No double bottom, deep, peak or independent tank manhole or hatch opening shall be used for fuel oil filling purposes, except on tankers where trunk hatches extend to weather deck and proper warnings are posted while operation is underway.

Hatches on tankers shall be kept closed during loading or discharging except when in use for such purposes. Tugs or other steam vessels shall not be allowed alongside when oil tank hatches are open.

64. *In Way.* While oil is being received or discharged, no open lights or fire, smoking, or electrical apparatus liable to spark shall be permitted within 50 feet of an opening in any oil hose, tank or compartment containing a tank or vents.

65. *Galley.* If practicable, galley fires in tankers shall be extinguished during loading or discharging; otherwise, openings to the galley shall remain tightly closed.

66. *Lights.* Loading or discharging should, as far as possible, be carried on in the day time. When carried on at night, no lights shall be permitted on the deck. Flood lighting or lights in clusters suspended in the rigging well above the deck are approved. Wires shall not lie on or drag across the deck. The use of portable connected electric lights on deck of tankers or in tanks or pump rooms of any oil burning or oil carrying vessels is prohibited.

ARTICLE VII. TANK CLEANING AND DISPOSAL

67. *Dry Dock.* When vessels containing fuel oil of any kind are in dry dock, care shall be taken that no oil drains onto the dock. Should it be necessary to remove oil from tanks, precautions shall be taken to prevent any oil escaping to form an accumulation of vapor or oil on or around the dock. Should any oil so escape, it shall be skimmed and disposed of ashore.

68. *In Port.* Tankers or other vessels carrying water for ballast in fuel oil compartments or double bottom, shall not discharge such water ballast into rivers or harbors or adjacent to ships or docks.

69. *Tank Freeing.* Tanks, valves and pipe lines throughout the vessel shall be freed of vapor in accordance with the regulations of Appendix A before repairs in way are undertaken.

ARTICLE VIII. PRECAUTIONS ON OIL BURNING AND TANK VESSELS

70. *Inspection.* The inside of oil compartments and tanks should be inspected at least annually; and bulkheads separating such compartments from others should be examined for leaks during inspections and whenever oil is taken aboard.

71. *Tank Readings.* Gage valves or cocks fitted to the storage or settling tanks shall be kept closed, except when a reading is to be made; and shall be closed immediately upon completion of the reading.

72. *Dampers.* Dampers in stacks and up-takes shall always be kept sufficiently open while burning oil, in order to prevent dangerous accumulations of vapor in the furnace or breechings with consequent blowing back into the fire room.

73. *Tests.* Whenever that part of the oil system subject to pressure has not been in use for a week, or after joints in the same have been remade, it should be tested cold under a pressure at least equal to the working pressure; and a careful inspection made for leaks before fires are lighted. All fuel oil fittings should at all times be kept in working order; and the oil slats, drafts, and valves should be frequently moved when not in use to insure such condition.

74. *Vents.* Frequent inspection shall be made to insure that wire gauze screens in vents are clean and intact.

ARTICLE IX. FURNACES AND FIRES ON OIL BURNING AND TANK VESSELS

75. *Re-Lighting.* In the event of oil accumulating in the furnace, such as might be caused by sudden extinguishing of the burners, the vapor must be blown out and drip oil removed before burners are again lighted.

76. *Fire Room.* Oil shall not be permitted to accumulate in the oil boxes, openings of furnaces, bilges, or on the floor plates; and no lighted material shall be allowed access to the bilges. After fires are out, bottoms of furnaces shall be examined and any oil remaining removed. In case of leakage of oil system in fire room, immediate action shall be taken to shut off the oil supply.

77. *Galley.* On tankers, when coal burning galley fires are lighted, the use of waste, chips, oil, etc., shall be prohibited, and only a limited amount of wood covered with coal shall be used. Every precaution shall be taken to prevent sparks or flame from blowing out the smokepipe.

78. *Low Flash Oil.* When oil of a flash point lower than 150 degrees F., closed cup, is used, attention is called to the extra hazard incurred by permitting any such oil to escape and gas therefrom to form an explosive mixture with the inclosed atmosphere of fire room or compartment. Rules for handling, heating and burning of such oil should be laid down by the superintending engineer according to his best judgment and experience, and no deviation therefrom on the part of engineering subordinates allowed. This general regulation is promulgated pending the results of further investigation of low flash oil hazards.

79. *Matches.* The use aboard tankers or oil burning ships of other than strike-on-box matches is prohibited.

ARTICLE X. CARGOES

80. *General.* A comprehensive treatment of the subject of hazardous cargoes and their packing and stowage is beyond the scope of these regulations; but specific cases for stowage of such cargoes may be referred to regulations of the following authorities: Interstate Commerce Commission for transportation on railways of United States as contained in Bureau of Explosives Pamphlet No. 9; United States Steamboat Inspection Service, as contained in Revised Statutes No. 4472, and special bulletins; and the Rules of the American Steamship Owners' Protection and Indemnity Association; which regulations the committee recommends adopting in full, pending regulations to be drawn by the Interstate Commerce Commission covering marine transportation as authorized by Act of Congress in March, 1921.

Appendix—A

Regulations for Freeing Oil Tanks, Bunkers and Compartments of Flammable and Explosive Vapors Previous to Entering for any Purpose or Making Repairs on Oil Burning or Oil Tank Vessel.

1. For the purpose of these regulations, an "explosive or inflammable liquid" is defined as one which when vaporized and mixed with air in proper proportions, is flammable or explosive.

2. No repairs of any kind shall be made to any tank, compartment, bunker, or other container or space, previously containing explosives and flammable liquids, in any vessel until the requirements hereinafter outlined have been complied with.

At sea or in ports where the means of carrying out these requirements are not available and the safety of the vessel necessitates emergency or temporary repairs, such repairs may be made to permit the vessel to proceed to the port of destination.

3. The process of freeing such containers of vapor shall be as follows:

4. (a) Tanks shall be closed and live steam blown into the tanks or space to be cleaned and all pipes leading thereto or therefrom for a period of time to be governed by the condition and the nature of the oil carried. Vent pipes shall be proved and left open.

Inasmuch as the time for steaming will be determined by the foregoing, no definite rule is laid down to cover all contingencies, but the following table is recommended as covering average general conditions:

Where:

L—Length of compartment in feet.

B—Breadth of compartment in feet.

H—Depth of compartment in feet.

The time of steaming is arrived at by taking the number of hours given in the table under the actual size of steam connection corresponding to the value given for $L \times B \times H$, or the volume in cubic feet of the compartment to be steamed.

Size of Steam Connection at 100 pounds pressure

Value of $L \times B \times H$ Not Exceeding	1 Inch Hours Steaming	1½ Inch Hours Steaming	2 Inch Hours Steaming
30,000	20	14	10
40,000	26	18	13
50,000	32	22	16
60,000	38	26	19
70,000	44	30	22

The above calculations are based on a steam pressure of 100 pounds per square inch.

Note: In steaming tanks the last one-fifth of the steaming period should be carried out with manhole plates or tank lids opened to the atmosphere.

(b) Upon completion of the operation above noted the tank or space so treated shall have all manhole plates and covers or other openings removed and thoroughly ventilated by means of wind sails, forced or induced draft.

(c) Following this process, specimens of air shall be taken by a competent chemist, whose ability and reliability shall be certified to by the American Bureau of Shipping. These samples shall be analyzed or tested by him, and if the tank or space from which samples have been taken still contains explosive or flammable gases, such further steaming, and/or ventilating shall be carried out as recommended by the chemist. After such steaming and/or ventilating, further samples shall be taken by him and analyzed or tested; this process to continue until the tank is certified by the chemist to be free of all explosive or flammable gases.

5. (a) In cases where a tank or space to be repaired adjoins another tank or space, no repairs shall be permitted unless adjacent tanks or spaces are freed of vapor as provided in paragraph 4 (c).

In cases where a vessel having carried cargo of flash point below 150 degrees F., closed up, is to undergo repairs at a shipyard, or alongside a wharf, all the vessel's compartments or tanks containing inflammable gases, with the exception of the ship's bunker tanks, shall have been steamed and ventilated for at least twenty-four hours prior to delivery to repair yard, and all tanks in which any repairs are to be made, and tanks adjacent to same, shall have been freed from explosive or flammable gases as provided in paragraph 4 (c); the balance of the tanks shall be sealed tight.

The only exception to this rule shall be, where the repairs to be made are confined exclusively to the engine and fire room spaces or/and to quarters, or where vessel is placed on dry dock merely for the purpose of cleaning and painting under water body and overhauling sea valves, in which case it will only be deemed necessary that all tank lids and/or covers shall be sealed tight.

(b) Repairs may be made to equipment, etc., in pump room without freeing from gas any space on the vessel other than pump room space.

(c) No repairs necessitating the use of fire or of tools liable to cause sparks by contact with metal, may be made to the decks of a vessel, except by special permission of the certified chemist, without first freeing adjacent tanks from explosive or flammable gases.

6. (a) The tests herein prescribed and required shall be made as provided by a competent chemist whose ability and reliability shall be certified to by the American Bureau of Shipping.

(b) Where oil or sediment liable to regenerate explosive or flammable gases has not been entirely removed from the tank in which repairs are to be made, the above mentioned certified chemist shall, when delivering to the interested parties the gas free certificate, required by these regulations, advise them as to the necessity, if any, of further testing of said tanks while undergoing repairs, and such tests shall be made before proceeding with repairs in the tanks.

7. While repairs or cleaning operations (but not air sampling) are under way, a current of air under forced or induced draft shall be continuously circulated through the tank or other space.

Note: Ventilation may be accomplished by wind sails, draft forced or indirect by a blower, pump or fan. It is recommended that compressor or other air unit have a minimum capacity of not less than 400 cubic feet of free air per minute.

8. (a) No open lights or fires shall be permitted within 50 feet of an opening in any tank or space not conditioned for repair as previously outlined. Lights carried into such tanks shall be electric of a type approved by the Bureau of Mines for use in gaseous mines. Electric hand flash lights may be used as accessories.

Note: If possible, all repairs should be made during daylight. Portable connected electric lamps are prohibited. Self-contained electric battery lamps may be used.

(b) No repairs of any kind shall be made until the foreman is provided with a permit signed by the superintendent. This permit shall not be issued until tank or other container has been freed of vapors as previously outlined, and shall be carried by the foreman in charge, and shown upon request to anyone in authority.

Note: It is recommended that a permit form similar to the following be used for this purpose:

Fire Permit No. Date.....
Permission is hereby granted to.....
(Foreman) to make repairs, including any repairs necessitating the use of fire on.....
as follows.....

Subject to the following conditions:

Fire to be kept as low as possible. All precautions to be taken to prevent sparks from flying. When finished using for the day, fire must be extinguished and coals thoroughly wet.

Approved

.....Supt.....

9. Should any emergency require the entering of a tank, bunker or other space before it is thoroughly free of vapors, the person or persons so entering shall be protected by a gas mask approved for such purpose by the Underwriters' Laboratories in accordance with tests prescribed by the United States Bureau of Mines. A rope shall be attached to the body of each man at work in the tank and each rope held by two strong men outside the tank. Persons at work within the tanks shall be under constant attendance, so that upon any indication of trouble they may be withdrawn.

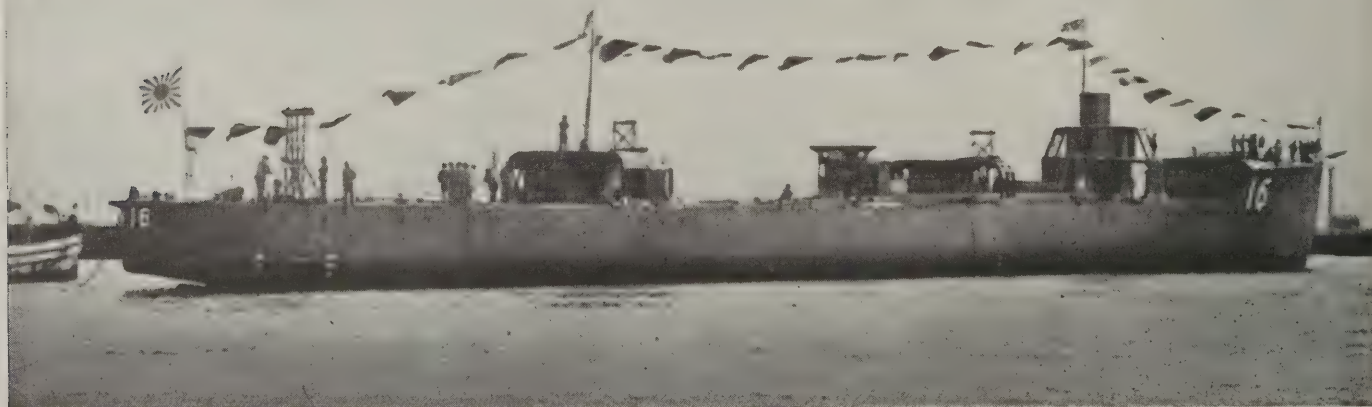
Oxygen breathing apparatus may be worn for a period of not more than 20 minutes, after which it shall be aired in fresh air for not less than 6 hours before further use. Wearers of respiratory apparatus shall be instructed and trained in their use before being permitted to enter a dangerous atmosphere.

The Isherwood System of Ship Construction Shows Remarkable Growth

THE progress returns for the "Isherwood" System up to the end of 1920 showed some remarkable figures regarding the number of orders placed, but a great falling off in the shipbuilding industry has taken place since that time which is reflected in the number of contracts made for vessels to be built on the "Isherwood" plan during the past two years. The following table, however, is of considerable interest because, in addition to recording the number and deadweight tonnage of "Isherwood" ships contracted for in each year from 1907 to 1922, it shows to some extent the general activities of the shipbuilding industry during that period of which the "Isherwood" System has taken no small part.

Year	Number of ships built under construction and on order	Deadweight Carrying Capacity
Sept., 1907, to Dec., 1908....	6	31,609
1909	30	181,384
1910	40	271,760
1911	64	474,043
1912	100	818,553
1913	30	215,686
1914	41	358,288
1915	157	1,196,899
1916	152	1,117,779
1917	180	1,666,150
1918	250	2,375,550
1919	210	1,887,000
1920	135	1,367,700
1921	23	70,000
1922	13	69,490
Total.....	1,431	12,101,891

FROM HAMBURG TO PERSIA BY WATER.—During the latter part of July, 1922, the Hamburg Shipping Company, August Bolten, dispatched a specially constructed steamer of 200 gross tons from Hamburg for Enseli, Persia, in order to ascertain the practicability of establishing a regular freight service between Germany and the Near East via the Russian waterways. The vessel sailed through Russian rivers, canals and lakes into the Caspian Sea loaded with a cargo of miscellaneous merchandise and is to remain at Enseli until ice conditions on the Russian waterways permit it to return to Hamburg with a cargo of native merchandise. In view of the apparent success of this expedition the shipping company is planning to extend its services and has placed orders for several ships of a type suited to this route.



(Photograph by Kadel & Herbert, N. Y.)

Japanese Battle Destroyer No. 16 Launched at Fushinagata Shipyard, Osaka, Japan

Stresses on Vessels of the Great Lakes Due to Waves*

By Professor Herbert C. Sadler† and Professor A. Lindblad††

When the Committee on Bulkheads and Freeboard met to consider the various problems upon which it was to report, the question of the possibility of including vessels on the Great Lakes in the assignment of freeboard arose. As little or no systematic investigation into the strength of this type of vessel had been made, it became necessary to make several strength calculations for the conditions met with in this region. As information of this character may prove of value in other fields, it was thought advisable to have the same in the permanent records of our society. The results of the principal parts of these investigations are submitted herewith.

IN considering the assignment of freeboard to vessels on the Great Lakes, it became necessary to find out what lengths and heights of waves might be expected. Little or no data upon this subject existed, so a series of instructions was issued to captains of vessels in order that they might observe and report upon the waves encountered. Although all possible care was taken on the part of the observers, there was still a chance of error. On the whole, however, the data obtained were sufficiently reliable for the purpose in hand.

A few of the general conclusions are as follows:

1. As a rule, waves over 250 feet in length are rarely encountered. In one case, a report was made of waves in the neighborhood of 350 to 400 feet after a severe storm on Lake Superior, but although the height was not observed it was evidently not of the usual magnitude, judging from other comments on the behavior of the ship.

2. The heights of the waves appear to be somewhat larger in proportion to their lengths than the usual ratio of 1:20, and probably vary between this figure and 1:15. The actual heights did not appear to exceed 20 feet as a maximum.

The following waves were therefore used in the calculations: (a) 325 feet by 20 feet; (b) 300 feet by 20 feet; (c) 250 feet by 16.7 feet and two special cases 325 feet by 15 feet and 350 feet by 20 feet, in order to obtain some intermediate data. As these waves are considerably shorter than the usual run of vessels on the Lakes today, it was necessary to perform two sets of calculations, one with the crest and one with the hollow at the bow.

Three types of vessels were chosen of the following dimensions: (a) 420 feet by 52 feet by 28 feet; (b) 504 feet by 56 feet by 30 feet; (c) 590 feet by 64 feet by 33 feet.

The wave profiles and corresponding positions of maximum bending moment are shown in Fig.

1 for all of the above cases, and the detailed shearing force and bending moment curves in the following Figs. 2 to 4.

As these vessels tend to sag when uniformly loaded, it is customary to put some additional cargo in the forward and after ends. This method of loading has been assumed as the proper one, although calculations were also made for uniform loading.

It will be noticed that both the magnitude and position

of the maximum bending moment depend upon whether the crest or hollow is assumed at the bow, and also that it depends upon the wave dimensions. If the effect of varying heights of waves of the same length is desired, it was found

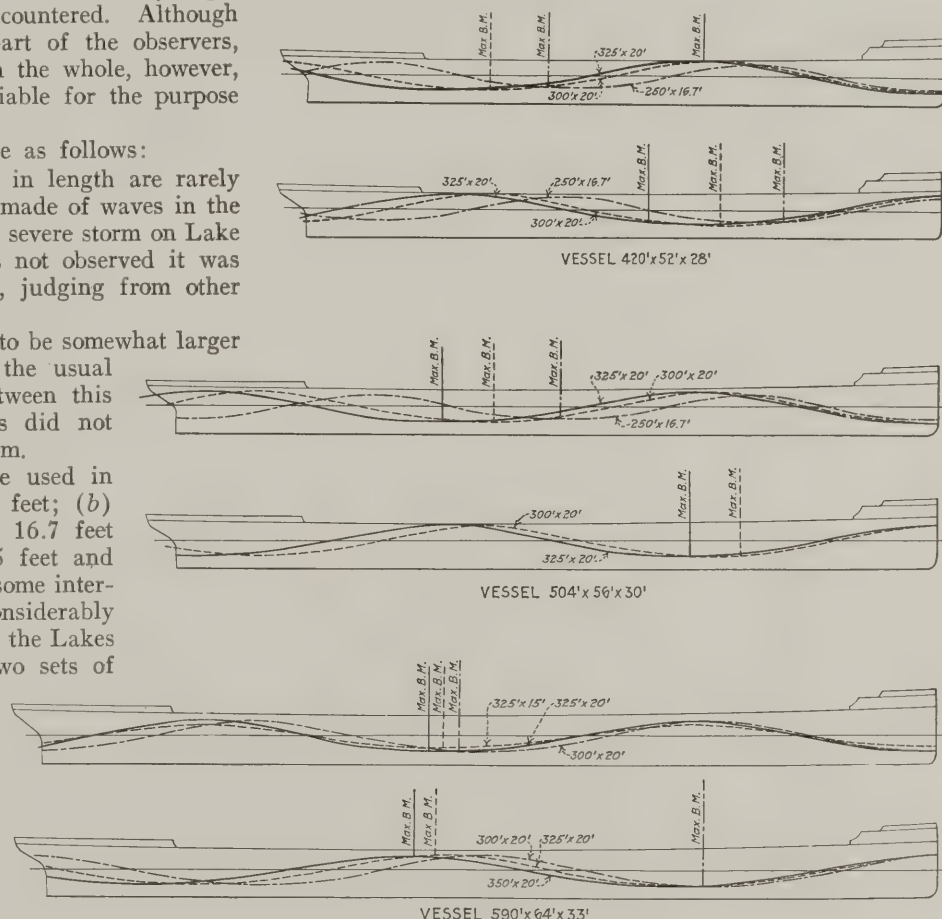


Fig. 1.—Wave Profiles

that, for moderate changes, the bending moment varies as the square root of the height.

The results have been summarized in Figs. 5 and 6 in the form of bending moment factors.

These charts are reproduced on page 107.

STRESSES

While the foregoing may be considered as general data with regard to bending moments on vessels, it may be of interest to add the special application in the determination of the strength of lake vessels.

If we take the form proposed by the British Committee

*Paper read at annual meeting of Society of Naval Architects and Marine Engineers, New York, November 8, 1922.

†Professor of Naval Architecture, University of Michigan, Ann Arbor, Mich.

†† Assistant professor of naval architecture, University of Michigan.

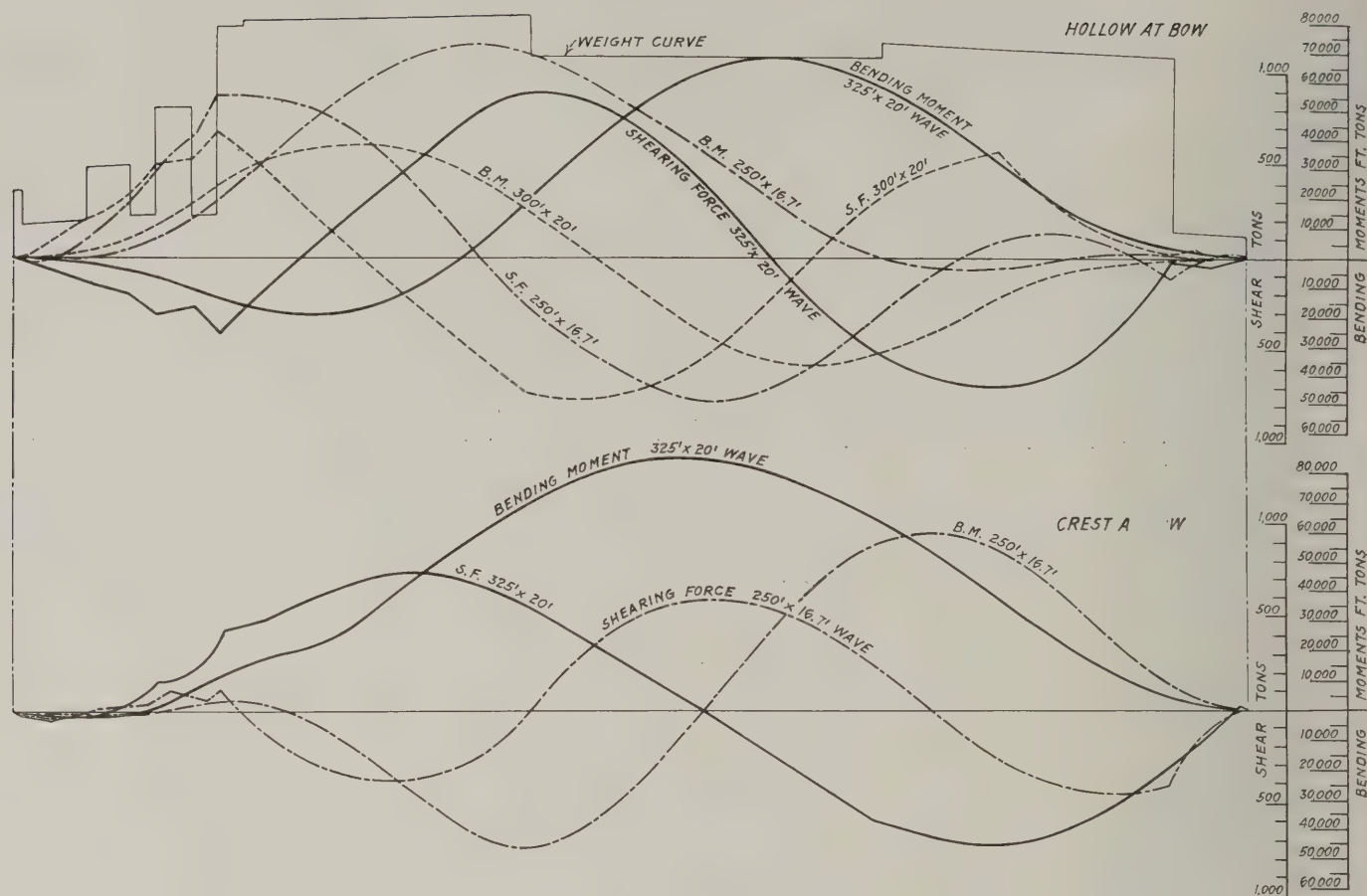


Fig. 2.—Vessel 420 Feet by 52 Feet by 28 Feet, Displacement 9,735 Tons at 19-Foot Draft

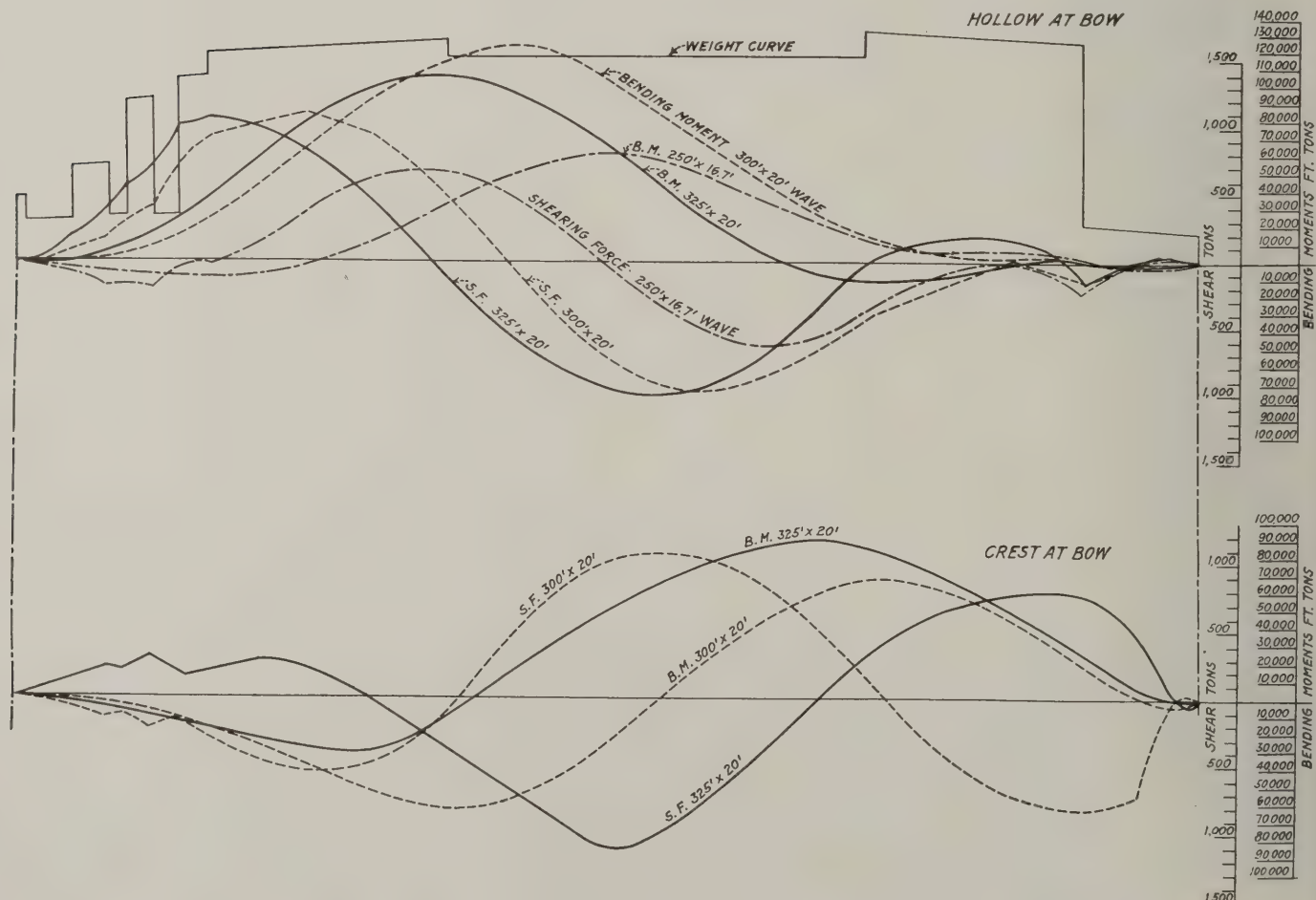


Fig. 3.—Vessel 504 Feet by 56 Feet by 30 feet, Displacement 13,025 Tons at 19-Foot Draft

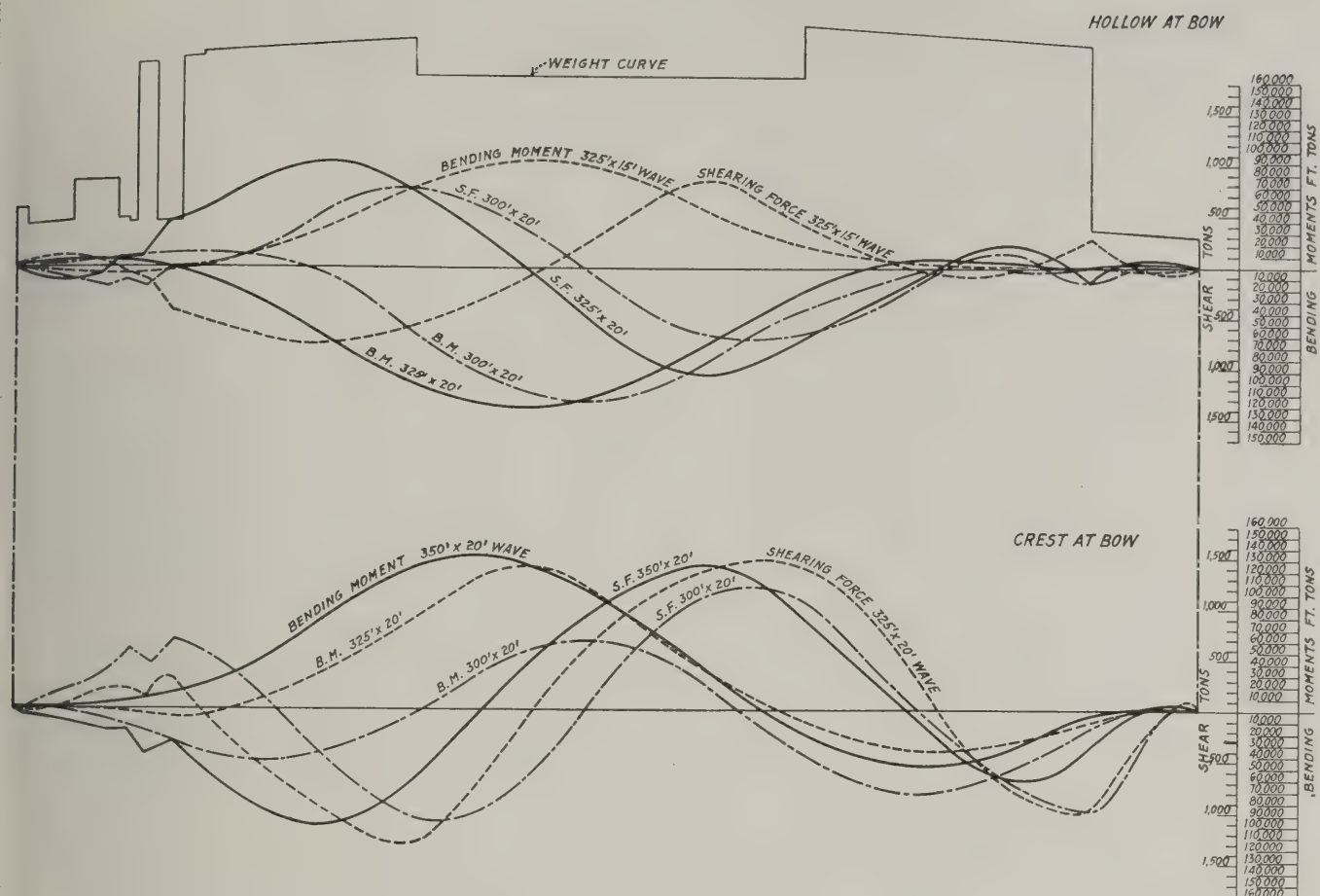


Fig. 4.—Vessel 590 Feet by 64 Feet by 33 Feet, Displacement 17,225 Tons at 19-Foot Draft

Freeboard, as representing the strength, viz., $\frac{I}{y} = f. d. B.$,

the following may be developed:

If s = stress, BM = bending moment, Δ = displacement, C = bending moment factor, and C_b = block coefficient:

$$\frac{I}{y} \times s = BM = \frac{\Delta \times L}{C},$$

$$f. d. B. \times s = \frac{L. D. d. \times C_b}{35} \times \frac{L}{C};$$

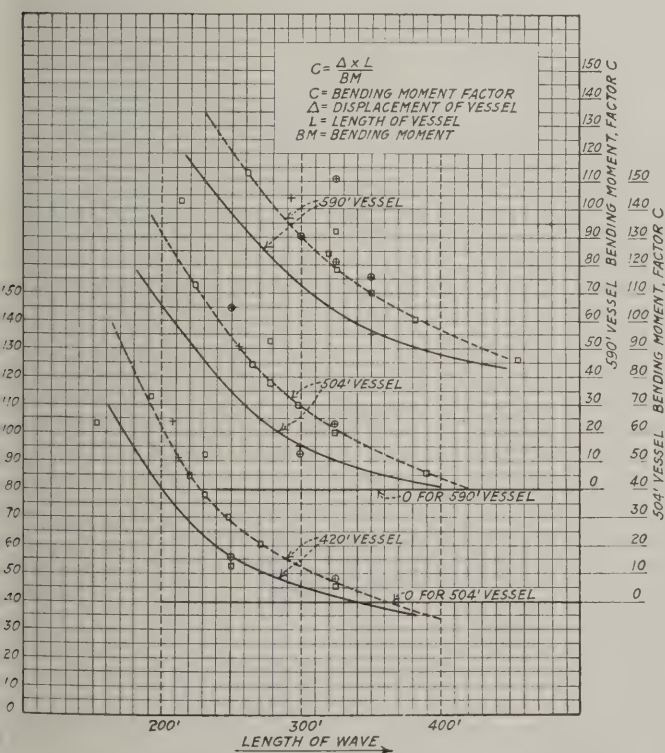


Fig. 5.—Bending Moment Factors

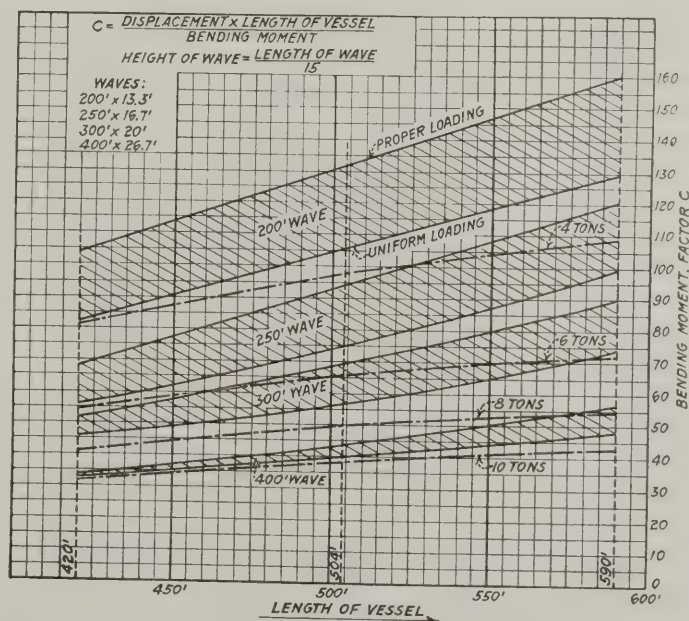


Fig. 6.—Bending Moment Factors and Corresponding Fiber Stresses

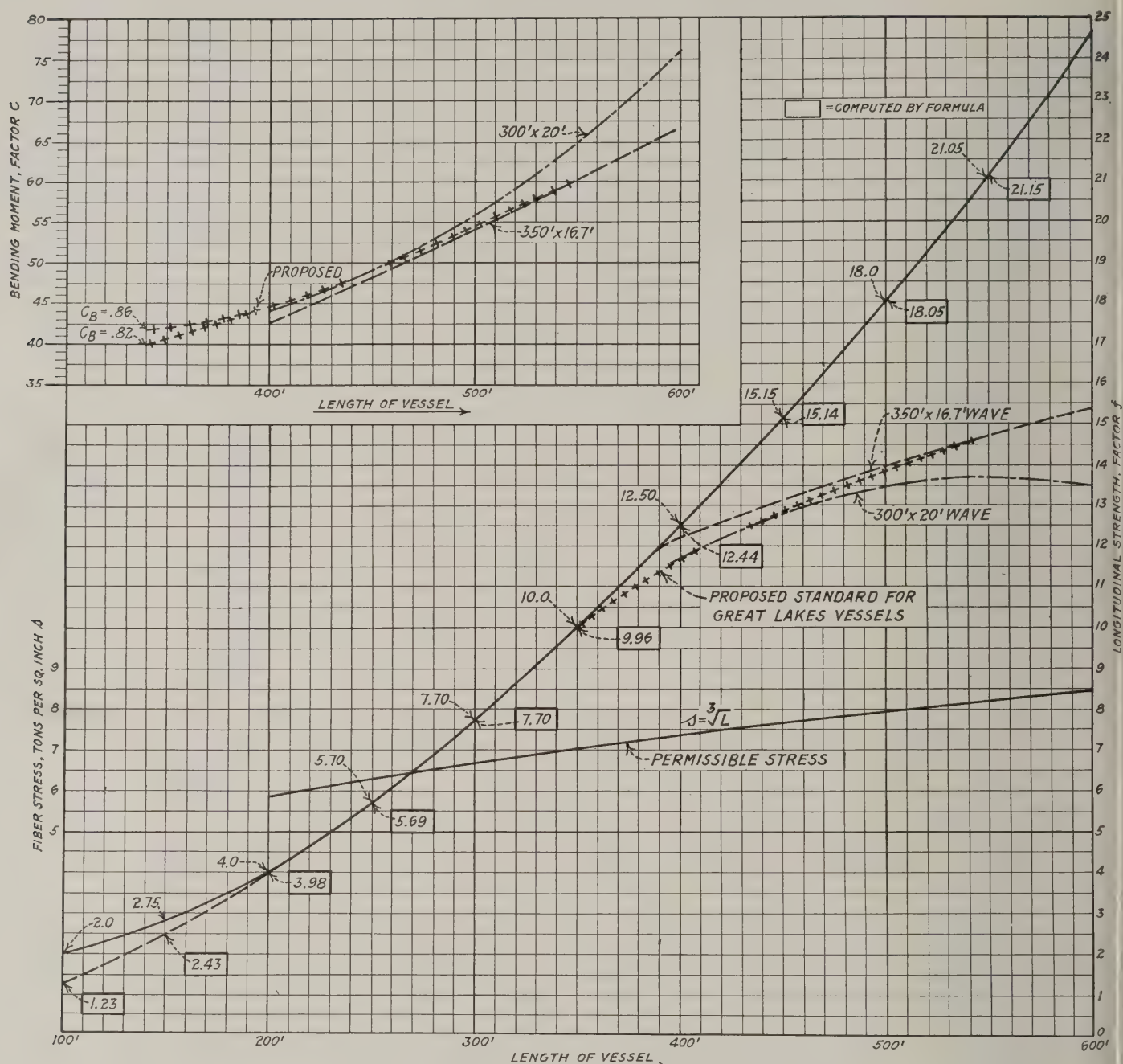


Fig. 7.—Standard of Strength

Definitions: $\frac{I}{Y} = f \times d \times B$, where I = longitudinal modulus of resistance; f = longitudinal strength factor, d = draft of vessel, B = breadth of vessel; $f = \frac{C_B}{C_{UB} \times C} \times L^{5/8}$, where C_B = block coefficient, C_{UB} = cubic feet of water per ton (35 for salt and 36 for fresh water), C = bending moment factor = $\frac{\text{displacement} \times \text{length}}{\text{bending moment}}$, L = length of vessel; $f = 0.000573 L^{5/8}$, for salt water, if $C_B = 0.78$ and $C = 39$; $f = \frac{0.0239 L^{5/8}}{C}$ for fresh water, if $C_B = 0.86$.

and if we assume $s = \sqrt[3]{L}$,

$$f = \frac{C_B}{35 C} \times L^{5/8} \text{ for salt water}$$

$$= \frac{C_B}{36 C} \times L^{5/8} \text{ for fresh water.}$$

The proposed values of f are shown on Fig. 7. It is obvious that if the waves on the Lakes do not exceed a certain definite length, the value of f should show a falling off

after this length is reached. This is indicated on the curves, and it is interesting to note that numbers of the present vessels, especially the larger ones, show an excess of the above values; or, in other words, from a strength point of view, they could be loaded deeper than the present depth of water available allows.

In conclusion, and in light of the above investigations, it appears that the lake freighters of today are, for their service, as strong as, if not stronger than, similar ocean-going types, and the statement that these vessels are weaker is not borne out by theoretical investigation or practical operation.



Scout Cruiser Omaha, the Highest-Powered Vessel Flying the American Flag. She Is Propelled by 90,000-Horsepower Westinghouse Turbines and Has a Maximum Speed of 35 Knots

Trial Run of Navy's Highest Powered Cruiser

**Thirty-Five Knot Vessel of Only 7,500 Tons Displacement is
Propelled by Westinghouse Turbines of 90,000 Horsepower**

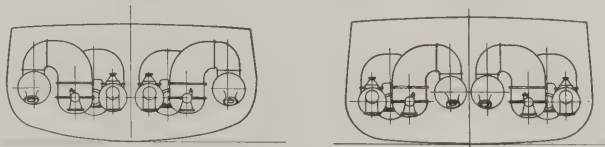
THE United States Navy Trial Board convened on January 30 at Tacoma, Wash., to supervise the preliminary acceptance trials of the scout cruiser *Omaha*, the highest powered vessel ever built for the United States Navy.

The *Omaha* was built at the plant of the Todd Shipyards Corporation and is the first of ten vessels of her type to be ready for her tests. The trial run was over the Vashon Island course in Puget Sound and lasted over a period of six hours.

These new cruisers are comparatively a new type, at least as regards steaming radius and high speed. The most noticeable features of the designs as compared with contemporary navies are their high speed of 35 knots, their displacement of 7,500 tons and their batteries of twelve 6-inch guns. They are practically exaggerated destroyers, for with a beam of 55 feet and a mean draft of 13 feet 6 inches, they

are 556 feet in length overall, giving a ratio of beam to length of one to ten.

A remarkable feature of the *Omaha* is the enormous power of the four Westinghouse turbines that propel her. When



Sections Through Engine Room

operating at full capacity, these engines will develop a total of 90,000 horsepower. Never before, on land or sea, has so large an amount of power been installed in so small a

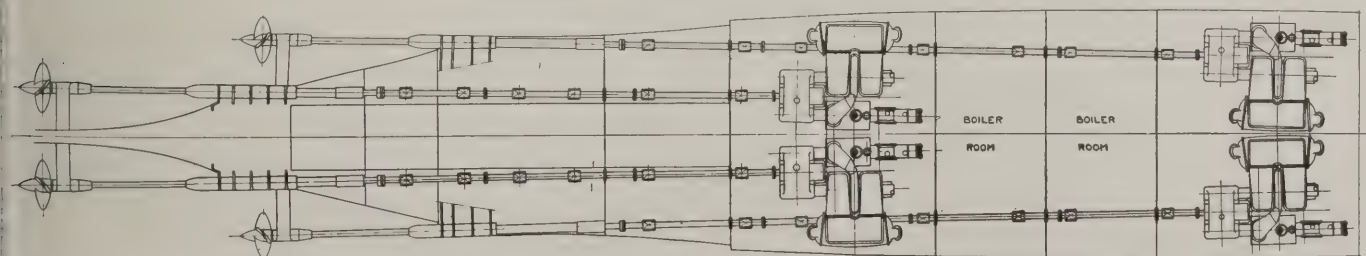


Diagram of the Omaha's Propelling Equipment, Showing the Compact Arrangement of Her High-Powered Turbines

space. The turbines of the *Majestic*, the largest steamship in the world, develop 100,000 horsepower, but the *Majestic* is nine times larger than the *Omaha*; while the *Olympic*, which is seven times larger than the scout cruiser, is propelled by engines of only 60,000 horsepower.

However, the *Omaha* needs 90,000 horsepower only when she is tearing through the water at the express-train rate of 35 knots, or 42 miles an hour. For ordinary cruising speeds of from 12 to 15 knots, a few thousand horsepower is amply sufficient. In order to avoid operating her big engines at so small a fraction of their rated capacity, four small cruising turbines are provided. These cruising turbines can be coupled to the propellers when desired and drive the ship at the low speeds with excellent steam economy.

An interesting novelty, at least in the United States Navy, is the adoption for the first time of the tripod mast, at the head of which is located a closed director-fire position, from which the fire from the battery of twelve 6-inch guns will be controlled. A second battery will consist of two 3-inch fifty calibre air-craft guns and two three pounder saluting guns. The vessels will carry two 21-inch twin torpedo tubes which will be located on either beam on the main deck between the aftermost funnel and the main mast.

J. S. Milne, chief engineer of the Todd Shipyards Corporation, who witnessed the trial run, said that no date has yet been set for the trials of the *Milwaukee* and *Cincinnati*, the two other scout cruisers built at the Todd yard.

A New Type of Multi-Stage Centrifugal Pump

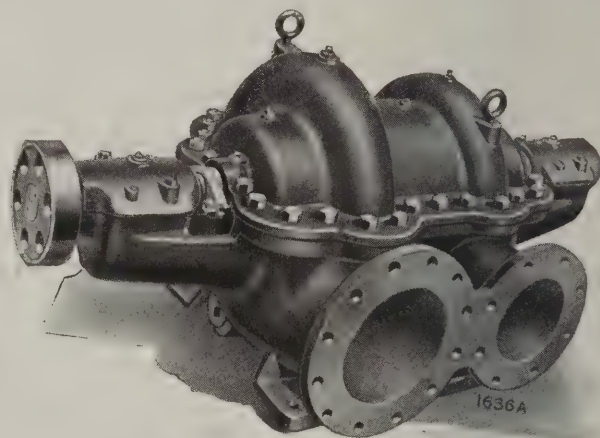
WHERE pumps driven by motors of slow or moderate speeds must deliver water at pressures higher than are desirable or practicable for a single-stage pump, instead of using a single-suction multi-staged pump, two separate single-stage pumps are sometimes connected in series, so that one discharges into the suction of the other. In medium and smaller sizes, the use of two independent pumps in series becomes somewhat more cumbersome, and a multi-stage pump is more often used. The length of shaft permissible in a multi-stage pump is limited because of the critical speed, and if many stages are employed, the designer no longer has a free hand in providing water passages of the shape and size conducive to the highest efficiency. Consequently, where more than three stages are required, the single suction impeller, which occupies less space on the shaft than does the double suction impeller, and thus permits the use of a shorter shaft, is used.

However, it is not possible to obtain as high efficiencies with a commercial multi-stage single-suction pump as would be possible in a single stage pump with double suction impellers, not only because of the less favorable limitations imposed on the impeller, but also because there is not sufficient space for an efficient volute diffuser and suitable return passages leading from the diffuser to the eye of the succeeding impeller. The De Laval Steam Turbine Company therefore developed a new type of multi-stage pump, known as a "series" pump, in which the advantages of the double suction impeller are retained. This is made possible by the use of a specially formed casing which provides individual volutes for each impeller, with ample interconnecting passages within the casing itself.

The double suction impeller gives perfect hydraulic balance and two of the stuffing boxes which would be required if two separate casings were employed are eliminated, together with their friction. As compared with a single suction impeller, the double suction impeller has a smaller suction eye, which permits of making the impeller itself smaller in diameter, and hence the pump can be built to operate at a higher speed for a given head and capacity, or for the same

speed, head and capacity, a higher efficiency is obtained. Besides giving the highest efficiency, the volute type diffuser is superior to diffusion vanes, in that it is not subject to clogging or rapid wear, and it also gives a broader efficiency curve, that is, a higher average efficiency over a wide range of delivery.

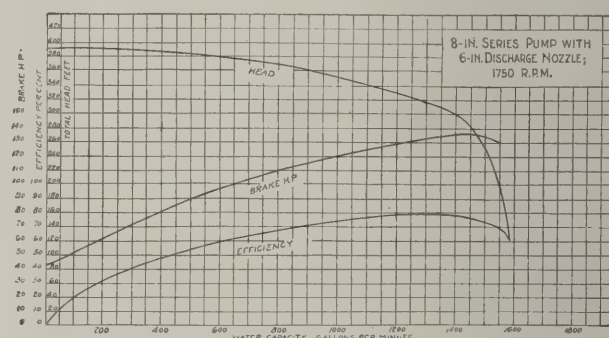
The pump casing is made in two parts, divided on a horizontal plane passing through the centerline of the shaft, the suction and discharge openings being in the lower part, so that they are not disturbed when the casing cover is lifted. Perfect form and smoothness in the suction and discharge



"Series" Pump with Double Suction Impeller

chambers and the passages connecting the volute of one stage to the suction chamber of the succeeding stage is secured by the use of dry sand molds in casting the casing and the cover.

Leakage from the discharge chamber of each impeller back to the suction chamber of the same impeller is prevented by the use of labyrinth wearing rings. One ring of each pair, known as the case protecting ring, is held in a recess formed in the casing and the casing cover. The other ring, known as the impeller protecting ring, is screwed onto the impeller. The intermeshing grooves of the labyrinth rings present a



Performance of 8-Inch "Series" Pump

long and tortuous path to water leaking from the discharge to the suction chamber, thus greatly reducing leakage while at the same time permitting the use of amply large running clearances. One proof of the effectiveness of this device in preventing leakage is the much longer life of such rings as compared with ordinary flat wearing rings.

The success attained by the series design in improving efficiency is shown by the accompanying chart. The efficiency curve is remarkably flat, that is, a high efficiency is maintained over a wide range of delivery. The advantage in this respect of the single-stage volute pump is now extended to multi-stage pumps of two and three stages.

Stability of Large Ships*

Comparison of G.M. When Ship Enters or Leaves Port and When at Sea

By Sir John H. Biles, K.C.I.E., LL.D., D.Sc.

BEFORE the contracts for some new ships were placed, my advice was asked as to the amount of G.M. (metacentric height) which should be provided for in the light condition. I suggested one foot as a proper amount—not that a less amount would not have been satisfactory, but that experience had shown that during the process of building, additions were likely to be made which would tend to reduce the amount in that condition. Many ships have G.M. in the light condition zero or negative, and are satisfactorily worked.

Obviously, the reliable method of determining the sufficiency of the stability of a ship is to compare the amount which she may have in any condition in which she is likely to be with that which satisfactory ships doing the same kind of work actually have. The recognized method of comparison is to find the G.M. in two conditions—first, the load condition, *i.e.* with coal, stores, passengers, baggage, mails, fresh water and cargo all on board. This corresponds to the state the ship will be in at the beginning of a voyage. The second is the arrival condition, in which coal, stores and fresh water have been nearly all consumed, and such water ballast added as may be found by experience sufficient to enable the ship to be satisfactorily worked.

STABILITY OF A SHIP ON ENTERING OR LEAVING PORT

There is no doubt about the weights of any of the things carried in the ship, except the cargo, which is of such varied character and quality that it is difficult to predict what its weight will be before it comes alongside the ship, and is not easy to determine even when it is there. The recognized method of allowing for cargo weights is to assume that they will be sufficient to load the vessel to her load waterline, and that the center of gravity of the weight will be at the center of gravity of the volume of the compartments of the ship which are devoted to cargo. Upon this assumption the G.M., in both leaving and arriving conditions, can be determined.

The assumption is believed generally to be on the safe side, because it is the general practice, where cargoes are varied in character, to put those of the heavier kind below. It is also frequently found in practice that general cargoes do not fill the cargo spaces, as the parts vary in size so much that it is quite impracticable to fill the spaces up to the beams. The consequence is that the centers of gravity of the cargo in the different compartments are all below the centers of the spaces, and the center of gravity of the ship and cargo is lower than the calculation shows.

Judged by this method, it may be found that a projected ship has as much or more G.M. in the load condition as many other large steamers. In the arriving condition, there may be special conditions in the ports of arrival that make comparison with steamers other than those trading to that port of little value. In some cases the margin of draft is so little that a small inclination of the ship will cause an increase of draft sufficient to cause her to touch the ground at the bilge. To determine the minimum amount of stability, it is necessary to know to what angles similar ships heel on entering the port; what their arriving drafts are; what amount of increase of draft is associated with definite

angles of heel. Such information is not always available, but it is desirable that it should be obtained, and the results interpreted.

It is, however, of interest to compare the two conditions of the ship in which she will have to be in when leaving and arriving in port. They are (1) the fully laden condition when leaving, and (2) the arriving condition after having crossed the ocean. The most unfavorable condition on leaving port, so far as liability to touch the bottom is concerned, is that when the ship is fully laden and is loaded with a cargo which will, in addition to filling the ordinary hold spaces, also fill the portable passenger spaces which may be used for cargo and the reserve bunker with cargo if this is so used. A special case has been taken by way of illustration. In this condition, which we may call (1), the vessel will leave with a G.M. of, say, 2.2 feet. If the ship does not incline, the draft at which she leaves the wharf will be the maximum draft which we need consider, and it may further be noted that in the case chosen a heel of 2 degrees on either side will not increase the draft, but for every additional 1 degree of heel, the draft will be increased by about 6 inches. In the case of the ship arriving at the port, there are two conditions, (2), when the ship arrives with a cargo of about 2,000 tons' weight, and with about 1,000 tons of coal in the bunkers. In this condition, the ship will have a draft of 26 feet 3 inches and a G.M. of 1.8 feet. The other unfavorable condition, (3), is when she arrives with a small quantity of cargo, say about 700 tons, in which case she will have a draft of 24 feet 10 inches and a G.M. of 1.3 feet. Whatever the disturbing cause may be which heels the ship, we can compare the relative effects in these three cases, (1), (2) and (3), and though the information may not be available to say to what angle the ship will heel, it can be seen what are the relative effects upon the increase of draft, due to any assumed disturbing cause.

The following table shows the degrees of inclination and actual drafts for the three conditions, (1), (2) and (3), due to a series of disturbing causes, which in succession will heel the ship in condition (1) to the number of degrees named in the column headed (1). The number of degrees in the columns headed (2) and (3) are the corresponding inclinations that the ships will have for the same disturbing cause.

	(1)	(2)	(3)
Degrees of inclination.....	5.0	6.0	8.4
Draft in feet	30.0	28.3	28.1
Degrees of inclination.....	10.0	12.0	16.8
Draft in feet	32.7	31.5	32.5
Degrees of inclination.....	13.0	15.6	20.0
Draft in feet	34.2	33.3	34.2

From this table it will be seen that in all cases the draft of the ship arriving is not more than that of the ship leaving.

Even in the case where the ship is inclined to the greatest angle, that of the ship leaving port is not less than the others.

It seems unlikely that there can be disturbing causes which could give the ship so much heel, because, if there were, other ships would have been heeled to similar angles, and their drafts would have been increased by about the same amount. If they had been, these vessels would have

*Paper read before the Institution of Naval Architects.

touched the bottom, and the case of the chosen vessel would be no worse than has been the case with them. If they have not touched, then the disturbing cause sufficient to make them touch cannot exist, but in none of the cases does it appear that any advantage would be gained in endeavoring to increase the stability of the ship by adding ballast to the ship or in any other way to avoid touching the bottom. The draft would be increased by the amount of the ballast, and in practically all cases the ship in the arriving condition is safer from touching than the ship in the leaving condition. It does not, therefore, seem to be desirable in the instance chosen to add ballast to the ship on account of the port conditions. Each case may have to be investigated on its merits, but a similar method of investigation should be followed.

The only other question which need be considered in the matter of the stability is that of the heeling of the ship, due to the action of the rudder, when she is in smooth water, and the effect that this heeling will have upon the minds of the passengers. No heeling is likely to be produced which can be dangerous to the ship. But a tender ship arriving in port is very likely to have heeling and oscillations set up under rudder action. There is no doubt that some passengers do not understand why a ship should incline and oscillate in smooth water, but oscillation by itself has no terrors for them, because when at sea in comparatively smooth water and with some small swell on, the vessel will roll for days to degrees of inclination of about an average of 5 degrees, with a maximum of 10 degrees, and the passengers take no notice of it. It seems, therefore, difficult to believe that anyone will be deterred from crossing in a ship on account of the tendency to roll in smooth water, under the rudder action, but the reputation of a ship for stability has to be carefully guarded, and it may be worth while to err on the side of large rather than small G.M. to avoid throwing doubt on a vessel's stability.

If the chosen vessel is in no respect different from other ships of the same class, and there has never been any question as to the safety of such ships at sea, with a G.M. as small as the chosen vessel is likely to have, no water ballast need be added to prevent the vessel from touching when rolling during entering port. It seems, therefore, desirable, before adding water ballast, to very carefully consider the above facts and arguments, and to gain further experience with the ship, before attempting to reduce her draft in the inclined condition by adding water ballast when entering port.

STABILITY OF A SHIP AT SEA

The stability of a ship at sea may be considered from two points of view, first, safety; second, comfort of passengers.

Safety.—By this is meant freedom from liability to capsize. The tendency to return to the upright is the measure of the stability. The causes which move the ship from the upright are (a) the action of the sea, (b) the action of the wind, (c) the shifting of weights inside the ship so that the center of gravity of the whole ship and her loading are not on the middle line and (d) the action of the rudder, about which it is not proposed to say more.

(a) *The Action of the Sea.*—This produces rolling when the sea is not directly ahead. The worst case of rolling is when the period of the waves and the natural period of the rolling of the ship are nearly the same. The natural period of rolling of a ship is what she would have if inclined to some appreciable angle in still water and released from it and allowed to oscillate. The period of the largest Atlantic ocean waves, those of 500 to 600 feet long, is 10 to 11 seconds. The period of a complete oscillation of a large Atlantic liner is about 20 seconds. The period of a ship varies as the beam and inversely as the metacentric height,

so that the broader the ship and the smaller the metacentric height the longer will be the period of roll of the ship and the less will the waves tend to synchronize with and therefore increase the rolling of the ship. Hence, small metacentric height is conducive to small rolling, and so far as the action of the sea alone is concerned, is conducive to safety.

(b) *The Action of the Wind.*—The wind produces the greatest heeling effect when blowing broadside on, and if it has continued for long in that direction will have raised a corresponding sea which will tend to roll the vessel. The wind tends to produce a mean inclination of the ship, and she will tend to oscillate about this mean inclined position. Suppose, for instance, the ship has a mean steady list of 10 degrees due to the wind, and that the action of the sea alone would cause her to roll 10 degrees on each side of a vertical line, she will roll when under the action of the wind to approximately 20 degrees to leeward of her own upright position. As only large waves can make a large ship with a small G.M. roll to large angles by synchronization, it is evident that generally it is better to have a ship with a small metacentric height which will therefore roll little, though that little may be about an inclined axis, than one with a large metacentric height which will roll to great angles about a less inclined axis.

The real question is what smallness of metacentric height is permissible; in other words, to what angle a ship may be allowed to heel under a steady wind pressure in order that her rolling may be reduced, so that the maximum angle to which she inclines shall be the least. Take an example of a ship with, say, $2\frac{1}{2}$ feet of metacentric height which under a wind pressure of, say, 8 pounds per square foot in a heavy gale, force 9 to 10, would incline to a steady angle of $5\frac{1}{2}$ degrees. Such a ship would have a period of oscillation of, say 20 seconds. If this ship's metacentric height be decreased to $1\frac{1}{4}$ feet she would have a steady heel about 11 degrees and her period would be increased to 28 seconds.

If the 20-second period would cause her to roll at least $5\frac{1}{2}$ degrees (the difference between $5\frac{1}{2}$ degrees and 11 degrees) more than the 28-second period ship, her maximum angle of roll to leeward would be more than that of the less stable ship. The motion of the 28-second period ship would be much slower than that of the 20-second period ship. The disadvantage of a greater mean inclination would exist in the less stable ship. Generally, there would be less liability to rolling in the more tender ship, so that the disadvantage of the greater mean inclination might be more than balanced by the advantage of the reduced frequency of rolling and the reduced maximum angle of rolling. It is therefore evident that for a steady wind the reduced stability may, on the whole, in this case, be an advantage. When we consider winds of exceptional force such as forces of 11 and 12, the mean angle of inclination may be undesirable, and it may be desirable to alter course sufficiently to reduce the heeling effect of the wind in the tenderer ship, but this is a very exceptional condition which can be met with safety.

The effects of gusts of wind of great force acting upon a ship when rolling have received some consideration. It has been assumed that it is possible, under very exceptional circumstances, for a ship to roll through 20 degrees on each side of the upright, and that when rolling to windward through 20 degrees she may at the end of a windward roll be struck by a squall of extreme violence which would, by its continued force and by the action of the roll from windward, cause her to roll to a much larger angle to leeward. To estimate the effect of such a combination of circumstances is not easy. The effect of resistance to rolling through large angles is not easy to estimate, but it is known to be very considerable, and if the roll to leeward due to the squall should be 30 to 40 degrees, the total roll would be 50 to 60

degrees, including the 20 degrees from windward. This roll would take place in less than 10 seconds and the velocity of oscillation would be very high. The effect of the wind pressure acting on the surface of a ship is not easy to determine. It can be calculated on an assumption as to the wind pressure on the surface in terms of its area and angle of inclination, but these assumptions may not be accurate. The only thing that seems to be possible is to compare the rolling of ships under such assumed circumstances, and to compare ships on such assumptions, which have for years successfully withstood the storms of the ocean, with any untried ship whose safety it is desirable to estimate.

This has been done in the case of four ships, of which A, B and C have been on service, and D, which is untried. Taking them all in the same conditions as to lading, with light cargo and in a spent and ballasted condition at the end of a voyage, it is possible to make a comparative estimate *disregarding resistance to rolling*, which is very large, but proportionately the same in all the vessels, and assuming the wind pressure to be proportional to the area exposed to the wind (force 10), the results are as follows:

A	32.5 degrees
B	39.5 degrees
C	33.5 degrees
D	37.5 degrees

This result is reached by equating the area of the wind moment curves from 20 degrees to windward to the angle on the curve of stability which includes the same area.

To take account of the resistance to rolling in such ships as these is not very easy. The method of doing so is to assume coefficients of resistance which are based upon experiments made upon ships which have been rolled in smooth water by moving weights across the ship in time with the rolling so as to gradually increase the extreme angle reached. Very few ships have been rolled: and these are nearly all warships. The angle reached has not been very great, nothing like the angles reached at sea when rolling under the action of waves. The laws governing the action of bilge keels in rolling are not fully known on account of the difficulty of carrying out systematic experiments on a large scale to verify any hypotheses. The best that can be done at present is to choose coefficients of resistance from the nearest suitable ship upon which experiments have been made.

H.M.S. *Revenge* was rolled in smooth water by swinging her turrets and running 300 to 400 men across the ship synchronously with the ship. She was rolled without headway and also at speeds of 10 and 12 knots. The bilge keels were 200 feet long and 3 feet deep, tapering at the ends, the actual area for both bilge keels being 1,170 square feet. The center of the keels was 41 feet from the center of gravity of the ship. The dimensions of the ship were: Length 380, breadth 75, draft 27 feet 6 inches; displacement 14,300 tons. The period of a single swing was about 16 seconds, that is, 16 seconds for a double swing. The metacentric height was about 3¾ feet.

The results of the experiments on the *Revenge* may be used for approximating to the resistance to rolling of ships like A, B, C and D, which are ships of about the same order of beam and draft. It will also be possible to compare ships such as these with other vessels of large dimensions which have been running in all kinds of Atlantic weather for many years.

If the resistance to rolling be neglected a comparison between ships having similar elements of resistance such as bilge keels can be made which, while not giving the actual angles to which the ships will roll, will give a means of comparing new ships with those that have successfully withstood the storms of many years. But we may approximate by using the experiments on the *Revenge* to the effect

of resistance and see whether the comparative results are much affected by this resistance. When this is done it must not be assumed that the reduced angles of roll so determined are accurate. They will, as before, only give a comparison of new vessels with old and successfully tried ones. The assumptions which have to be made in order to obtain comparative quantitative results of considerable magnitude (and it is of little use to consider only cases in which the rolling angles are small) must necessarily be only assumptions, and may not represent the actual facts of the case. But they will afford a comparison which for somewhat similar ships ought to enable us to form an opinion on the safety of new ships. On the same assumptions as those already made when resistance to rolling was neglected, *viz.* being struck by a squall, force 10, when at

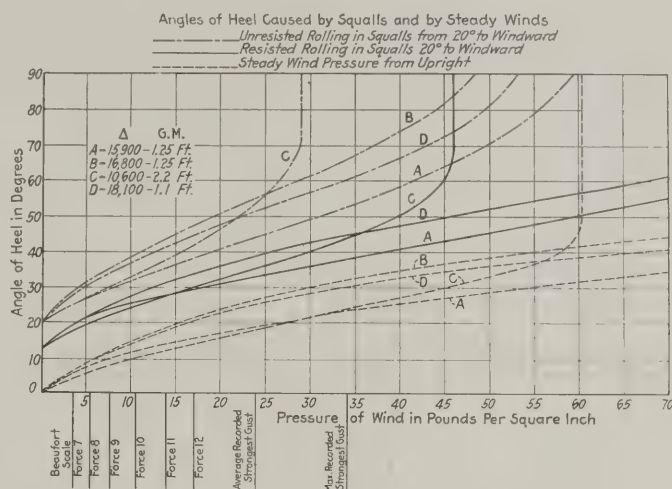


Fig. 1

20 degrees to windward, the resistance has been approximately calculated with assumed pressures of wind, the angle reached being as follows:

A	25 degrees
C	24½ degrees
D	27½ degrees

B is so near to D that the results have not been worked out. It seems from these results that there need be no apprehensions of the safety of D.

Another instance has been taken which is of comparative value. The vessels E, F, G and H are vessels which have been successfully crossing the Atlantic for from twenty to twenty-five years. They are not dissimilar in dimensions, being 63 feet beam and 28 feet draft, but being much older have less lofty deck erections. The determining factors are the exposed area of side and the maximum righting moment of the curve of stability. In these respects these four vessels are very similar to each other. The case of one, E, has been taken. The inclining effect of the wind pressure is about one-half that of D. Neglecting resistance to rolling it is found that a wind pressure of about 32.7 pounds per square foot would bring E to a condition in which she would reach an angle of roll of about 70 degrees under the same assumptions as to weather roll and leave her with practically no margin of stability, so that a little higher wind pressure would completely overset her. In this condition, D would reach 58 degrees and would have a considerable margin of stability so that she could receive a considerable increase of wind pressure without oversetting. It may therefore be safely assumed that D is at least as safe as E which has for over thirty years successfully continued to run. If we take account of resistance to rolling, the comparison is still better for the ships with bilge keels,

for the four ships E, F, G and H have no bilge keels, and it was demonstrated in the case of the *Revenge* that the resistance to rolling due to bilge keels is such that at comparatively small angles the angle of roll without bilge keels was about three times what it was with bilge keels. In the case of D, if resistance be taken into account, a 32.7 wind pressure will incline her in a squall to $43\frac{1}{2}$ degrees, while E would probably incline to 60 degrees.

It seems, therefore, that there need be no fear for the safety of D.

(c) The third cause which has to be considered is that of shifting the center of gravity of the ship by shifting weights inside her. If the vessel rolls to the large angles, there will be a tendency to shift fuel and cargo. There can be little chance of shifting coal, because in the condition of loading assumed there is but a small quantity of coal left, and this generally will be in the side bunkers which will not permit of much shifting. In other conditions of loading, such as the reserve bunker being partially filled, there is not much chance of coal shifting, as the firemen's passage or some other longitudinal division is in the ship, but the center of gravity of the ship will be lower and the stability greater. Loose water or oil may cause shifting of the center of gravity of the ship, but tanks are usually well divided, and it is usual to empty a tank before beginning to broach another. This should be done as a matter of routine. Where practicable the lee tank should be emptied before the corresponding weather one. The free surface of a tank partially filled tends to set up oscillations which tend to neutralize the effect of inclination. The shifting of cargo is possible, but with ordinary precautions in loading this is not likely to occur. In the case of grain cargoes the trunks leading to the holds will necessarily be well filled to provide feeders for the sinking of the grain. The hatches of the decks below on the trunks should be left off to allow the grain to flow through them as it settles. Special instructions for stowing the grain to avoid the chance of shifting should be systematically given effect to. With these precautions there should be no chance of any appreciable shift of coal or cargo in these vessels.

In the case of heavy rolling due to unusually great wind pressures, it will naturally suggest itself to the master of the vessel to alter course so as to avoid the effects of the abnormal wind pressures. These cases will occur too seldom to appreciably interfere with the successful running of the ship.

The comfort of passengers in rolling is dependent largely on the maximum angle of roll and the period in which this angle is rolled. Those who have been to sea in quick rolling ships, especially if the ships are rolling through large angles, are familiar with the great acceleration which their bodies experience, especially on the top decks far distant from the center of motion. In clear transverse spaces in broad ships the effect of this acceleration is to cause them to find difficulty in holding on to some fixed part of the ship, and if they do not happen to have something to hold on to they will find the operation of being stopped fraught with risk of knocks and possibly bruises. Hence, it is desirable to provide long periods and small angles of roll for the comfort of the passengers.

The question of the relation between the effect of the wind pressure on modern high-sided ships and the meta-centric height is one deserving of the most careful consideration. The curves shown on Fig. 1 give the angles of heel of the ships A, B, C, D, under wind pressures acting steadily or in squalls. The angles of heel are given in the cases when resistance is and is not taken into account.

No attempt has been made to determine the angles of roll due to the action of the sea. This subject is best treated experimentally. To those interested a summary of the general question of rolling given in my Presidential Address

to the Engineering Section of the British Association in 1911 (see *Transactions* of Section C, British Association Meeting at Portsmouth, 1911) may be usefully consulted.

Fiber Flooring for Ship Decks

A NEW type leather and asphalt composition flooring for ship, industrial and office service is being marketed by the James A. Coffey Engineering Corporation, New York. The flooring is made from strips of scrap leather impregnated and bonded in asphalt by a large shoe manufacturing concern as a by-product. It is laid in



Fiber Flooring Is Laid in Asphalt in Sheets 16 by 28 Inches

sheets, 16 inches by 28 inches, and weighs less than four pounds per square foot.

This flooring can be laid over any surface and is ready for use as soon as put down. It can be used as a finished flooring or decking or as an under flooring or decking on ships where it is bonded to the deck and stops the corrosion of steel. Composition, linoleum, rubber and cork tile can be laid over the flooring. The combination of leather and asphalt gives a resilient, noiseless and slip proof surface.

Service tests have been carried out on this flooring over



An Oxy-Acetylene Flame of 6,000 Degrees F. Merely Scorches Fiber Flooring to a Depth of $\frac{1}{4}$ Inch

a period of three years during which time it has been subjected to heavy traffic, heat tests, foot wear and other methods of use to determine its wearing qualities. In the course of the tests, samples of this flooring were exposed for two minutes to the flame of an oxy-acetylene torch and even under the resulting temperature of 6,000 degrees F. were charred only to a depth of $\frac{1}{4}$ inch without flaming. It was also laid in drying rooms where it was exposed to a constant heat of 300 degrees F. without deterioration.

The special features claimed for the flooring are that it is a non-conductor of heat, will not expand or contract, curl or lift, is water and slip proof, sanitary and has long life.

Proportions and Block Coefficients of Merchant Ships*

Increased Beam an Advantage, If Depth and Draft Are Increased
—Economic Proportions Dependent on Depth of Harbors

By W. J. Lovett

LOYD'S REGISTER for 1921-22 contains particulars of about 28,500 steamers, and their analysis on a speed basis is given in Table I.

TABLE I

Speed	Not Exceeding 13 Knots	Over 13 and Under 16 Knots	16 Knots and Under 19	19 Knots and Under 22	22 Knots and Over
Number of vessels....	27,220	737	361	77	34

From these figures it may be assumed that about 3 percent of the merchant steamers of the world are engaged primarily in the passenger trade and the remaining 97 percent are cargo carriers.

An individual analysis has been made for about 700 vessels of 15 knots' speed and over. The dimensions of each were proportioned to a common length of 400 feet, and the comparative mean breadths at varying speeds are shown in Table II, omitting such special vessels as American river steamers. The analysis is given for two groups, viz., vessels of less length than 400 feet and vessels exceeding 400 feet in length.

TABLE II

Mean Proportionate Breadths for Length of 400 Ft.

Length	15-17 Knots Ft.	17-19 Knots Ft.	19-21 Knots Ft.	21 Knots and Over Ft.
Vessels under 400 ft.....	51.4	50.2	49.4	48.5
Vessels over 400 ft.....	48.0	47.0	46.5	44.5

It will be noted that there is a gradual reduction of beam as the speeds increase, and that the small steamers have adopted, or been forced to adopt, greater beam than the large steamers, and this increase becomes more marked when

V

the vessels are considered on a $\frac{V}{\sqrt{L}}$ basis. The market

for, or the supply of, large steamers of 19 knots or over is limited, as there are only 26 vessels of that speed over 400 feet in length, whereas there are 27 vessels under 300 feet, and 58 between 300 and 400 feet that are capable of this speed; so that the fast steamers of our mercantile navies are preponderatingly of short length. Table III has been prepared to illustrate this feature.

TABLE III

Number of Vessels

Speed	Under 200 Ft. Long	200-300 Ft.	300-400 Ft.	400-500 Ft.	500-600 Ft.	Over 600 Ft.
Above 23 knots.....	0	3	10	0	0	4
21-23 knots.....	0	6	24	0	4	4
19-21 knots.....	0	18	24	3	9	2
18-19 knots.....	1	24	17	8	15	7
17-18 knots.....	3	30	26	25	29	9
16-17 knots.....	4	53	39	38	27	6
15-16 knots.....	9	61	40	78	28	1
Total.....	17	195	180	152	112	33

A comparison is made in Table IV between a summary of Table III and a similar analysis prepared from Lloyd's Register for 1914. This shows that at present there is a shortage of almost 200 steamers of 15 knots' speed and over as compared with the 1914 returns, which means that

the world's existing fleet of fast merchant steamers is 20 percent less in numbers than pre-war standard.

TABLE IV

Speed	Number of Vessels	
	1914-15	1921-22
Above 23 knots.....	23	17
21-23 knots.....	46	38
19-21 knots.....	90	56
18-19 knots.....	101	72
17-18 knots.....	125	122
16-17 knots.....	209	167
15-16 knots.....	284	217
Total.....	878	689

Excess of beam involves excess of power in fast vessels where the wave-making resistance is a dominant feature, but in cargo carriers the resistance is largely frictional, and dimensional proportions may be modified within wide practical limits without detriment to the propulsive efficiency. Existing cargo tonnage has a mean breadth of about 1/10L. plus 11 feet, but the published returns of recently built steamers show that the present practice favors increased beam in proportion to length, as is indicated in the list of some broad vessels given in Table V, which could be considerably extended.

For convenience of analysis the beam of each vessel has been proportioned to a common length of 400 feet.

TABLE V

Name of Vessel	Length Ft.	Beam Ft.	Draft Ft. In.	Beam for 400-ft. Length Ft.
John D. Archbold.....	555	75.0	30 0	54.1
Keystone State.....	518	72.0	30 6	55.6
Amsterdam.....	476	65.7	.. ..	55.2
Almelo.....	447.5	62.8	.. ..	56.2
Ohio.....	445	61.2	26 9	55.0
Nagara.....	430	61.3	29 4	57.0
Agwimars.....	429	59.2	25 7	55.2
Brielle.....	402	58.3	.. ..	58.0
P.L.M. 20.....	400	56.0	25 1	56.0
Burgedijk.....	400	54.0	30 2	54.0
Boren.....	377	54.0	24 2	57.3
Assiont.....	370	51.2	24 0	55.3
Kedoe.....	367	51.5	23 2	56.1
Maplemore.....	365	51.0	23 7	55.9
Saint René.....	351	52.5	24 4	59.8
Digby.....	350	50.0	23 6	57.1
Urd.....	334	48.0	21 3	57.5
Sierra Morena.....	331	48.7	22 0	58.8
Kielehaven.....	327	47.3	20 5	57.8
Victor de Chavarri.....	312	48.0	20 2	61.5
Omana.....	303	46.2	19 3	60.9
Sebastian.....	303	43.0	19 10	56.7

Separating the larger of the above vessels from the smaller ones, then, for a common length of 400 feet,

(1) Vessels 400 feet and upward have mean proportionate beam of 55.6 feet.

(2) Vessels under 400 feet have mean proportionate beam of 57.9 feet.

The *Keystone State*, a vessel of 518 feet length, has a beam of 1/10L. plus 20.2 feet.

The *Victor de Chavarri*, a vessel of 312 feet length, has a beam of 1/10L. plus 16.8 feet, and the *Nagara*, a vessel of 430 feet length, has a beam of 1/10L. plus 18.3 feet.

The depth of water available at a port will determine the maximum permissible draft when entering the port, and, as all vessels entering any port are thus limited in draft, it follows that the proportions of beam to draft will vary considerably. For cargo carriers with erections extending over 60 percent of the length, the assigned freeboard draft is a fairly constant fraction of the depth and is only slightly modified by length, sheer and block coefficient. Taking the

*Paper read at the sixty-third session of the Institution of Naval Architects.

TABLE VI—BLOCK COEFFICIENT

	Length ÷ Breadth																			
V																				
√ L	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	
.70	.647	.653	.659	.664	.670	.676	.681	.686	.691	.696	.701	.705	.710	.714	.719	.723	.728	.732	.737	
.69	.653	.659	.665	.671	.676	.681	.686	.691	.696	.701	.706	.711	.715	.720	.724	.729	.733	.737	.742	
.68	.660	.666	.671	.677	.682	.687	.692	.697	.702	.707	.712	.716	.720	.725	.729	.734	.738	.742	.747	
.67	.666	.672	.678	.683	.688	.693	.698	.703	.708	.712	.717	.721	.726	.730	.735	.739	.743	.747	.752	
.66	.673	.679	.684	.689	.694	.699	.704	.709	.713	.718	.722	.726	.731	.735	.739	.744	.748	.752	.756	
.65	.679	.685	.690	.695	.700	.705	.709	.714	.719	.723	.727	.732	.736	.740	.744	.749	.753	.757	.761	
.64	.686	.691	.696	.701	.706	.710	.715	.720	.724	.728	.732	.737	.741	.745	.749	.753	.757	.761	.765	
.63	.692	.697	.702	.707	.711	.716	.721	.725	.729	.733	.737	.741	.745	.750	.753	.757	.761	.765	.769	
.62	.698	.703	.708	.713	.717	.722	.726	.730	.734	.738	.742	.746	.750	.754	.758	.762	.766	.770	.773	
.61	.704	.709	.714	.719	.723	.727	.731	.735	.739	.743	.747	.751	.755	.758	.762	.766	.770	.773	.777	
.60	.710	.715	.720	.724	.728	.732	.736	.740	.744	.748	.752	.755	.759	.763	.766	.770	.773	.777	.780	
.59	.716	.721	.725	.729	.733	.737	.741	.745	.749	.752	.756	.760	.763	.767	.770	.774	.777	.781	.783	
.58	.722	.726	.731	.735	.739	.743	.746	.750	.754	.757	.761	.764	.767	.771	.774	.777	.781	.784	.787	
.57	.727	.732	.736	.740	.744	.748	.751	.755	.758	.762	.766	.769	.772	.775	.778	.781	.784	.787	.790	
.56	.733	.738	.741	.745	.749	.752	.756	.759	.763	.766	.769	.772	.775	.778	.781	.784	.787	.790	.793	
.55	.739	.743	.747	.750	.754	.757	.761	.764	.767	.770	.773	.776	.779	.782	.785	.788	.791	.794	.796	
.54	.744	.748	.752	.755	.758	.762	.765	.768	.771	.774	.777	.780	.783	.786	.788	.791	.794	.797	.799	
.53	.749	.753	.757	.760	.763	.766	.769	.772	.775	.778	.781	.784	.787	.790	.792	.795	.797	.800	.802	
.52	.755	.758	.762	.765	.768	.771	.774	.777	.779	.782	.785	.787	.790	.792	.795	.798	.800	.803	.805	
.51	.760	.763	.766	.769	.772	.775	.778	.781	.783	.786	.788	.791	.793	.795	.798	.800	.803	.805	.807	
.50	.765	.768	.771	.774	.777	.780	.782	.785	.787	.790	.792	.794	.796	.799	.801	.803	.806	.808	.810	

same block coefficient, same proportions of deck erections, and same sheer ratio, then

draft = 0.83 depth for 350-foot steamer.

= 0.81 depth for 400-foot steamer.

= 0.79 depth for 450-foot steamer.

If the draft of the vessel is limited, the depth for dead-weight cargoes is fixed by the addition of draft and freeboard, but where the draft is not so limited the depth is fixed by the beam, in order to give a stable vessel under ordinary conditions of lading; and as increasing the draft is the cheapest way to obtain deadweight, this vessel will be the best paying for its owner. Stable proportions of depth to breadth will vary with the erections, but assuming 60 percent of the length to be covered by erections, then a stable depth may be taken as 0.63 beam. Dealing only with two dimensions, it will not lessen the cost, if a vessel of ordinary proportions is made shorter and broader, because, although breadth is slightly cheaper to build than length, there must be a reduction in the block coefficient of the shorter and broader vessel. When, however, the adoption of the greater beam can be utilized to increase the depth, and consequently the draft, it does pay an owner to modify the dimensional proportions of his vessel, and the economical grades between the vessel of ordinary and extreme proportions are largely dependent on the permissible load draft.

The limits of present-day practice may be stated as:

Breadth = 1/10 length plus 18 feet

Depth = 0.63 of breadth

Draft = 0.81 of depth (for 400-foot length)

This gives a vessel 400 feet × 58 feet × 36 feet 6 inches and 29 feet 6 inches draft, and this maximum economic limit for hull cost of ratio of beam to draft is 1.97, but it is seldom practicable to have so deep a draft, and the mean proportionate breadth and draft of the vessels in Table IV may be stated on a 400-foot length basis as 57 feet × 25 feet 9 inches, or a ratio of 2.21 and a difference of 3 feet 9 inches in the draft. An owner is therefore prevented from going to the limit of maximum economic proportions until the available depth of water at the various ports is made suitable for the increased load draft.

The determination of the block coefficient is usually a matter of comparison with similar vessels, but the publication of various model experiment results has suggested a manner of arriving at a maximum fullness of form compatible with economy of propelling power, and presuming in all cases a well-established tank form of model. The proceedings of the technical societies in this and other countries contain records of model experiments variously set out, and in most cases made to demonstrate some definite postulate. These available results, when applicable to cargo vessels, have been plotted to Froude's (K) and (C) values, and in

each case a note was taken of the (K) speed value at midway on the first definite steepening of the (C) curve, denoting an increase in resistance ratio. This frequently occurred in 400 to 450-foot vessels at a (C) value of about 0.7, so that it may almost be inferred that cargo vessels of good tank form of model have their maximum speed for economical propulsion at that (K) value where the (C) curve crosses the 0.7 value datum. Many slow-speed forms have been tried in the tank to give smaller (C) values than 0.7 at the designed speed, although in these cases it is probable that the models could have been made fuller and better paying propositions for their owners, but there is undoubtedly a distinct range or latitude of fullness or fineness, and the owner must decide whether it pays him better to have a fine model and low engine power or to have a full model and high engine power.

The block coefficients in Table VI will enable a form to be designed suitable for the speed intended, but of course a still fuller coefficient might be employed at the expenditure of an excess of power and fuel consumption, and vice versa. These block coefficients are intended to be applied to vessels having midship coefficients within the limits of 0.96 to 0.99, and lengths within the limits of 350 feet to 550 feet.

The results of detailed comparative calculations for various vessels are given in Tables VII, VIII and IX. In each table Type A is a vessel of ordinary proportions having a beam of 1/10L. plus 12 feet, and also of average draft. Type B has same draft but a beam of 1/10L. plus 18 feet. Type C has the extreme beam of 1/10L. plus 18 feet, but has the maximum depth for safe stability and the maximum draft for this depth. The depth in Types A and B have been determined by the addition of the draft and freeboard. In all cases the vessels have plain cargo boat specifications

TABLE VII—6,000 TONS DEADWEIGHT, 10½ KNOTS' SPEED

Item	A	B	C
Length	357 ft.	343 ft.	319 ft.
Breadth	47.7 ft.	52.3 ft.	49.9 ft.
Depth	27.25 ft.	27 ft.	31.42 ft.
Draft	23 ft.	23 ft.	26 ft. 3 in.
Coefficient	0.771	0.733	0.712
Displacement	8,630	8,630	8,500
I. H. P.	1,540	1,620	1,620
Cost of hull	100	100	93

and erections covering 60 percent of the length. The comparative indicated horsepower in each case is stated, and the method of arriving at this power is given in the Appendix.

TABLE VIII—9,000 TONS DEADWEIGHT, 11 KNOTS' SPEED

Item	A	B	C
Length	408 ft.	393 ft.	372 ft.
Breadth	52.8 ft.	57.3 ft.	55.2 ft.
Depth	32 ft.	31.75 ft.	34.83 ft.
Draft	26 ft.	26 ft.	28 ft. 7 in.
Coefficient	0.782	0.75	0.737
Displacement	12,530	12,530	12,360
I. H. P.	2,400	2,370	2,360
Cost of hull	100	100	93

The hull cost, being chiefly dependent on the weight of steel, is comparatively shown as a percentage in all cases, and the basis figure of 100 is given to Type A vessels of ordinary proportions and average drafts.

where A, B, C, D are values given in the following tables A, B, C, D.

Δ = displacement in tons,
V = speed in knots,
L = length in feet.

TABLE IX—12,000 TONS DEADWEIGHT, 11½ KNOTS' SPEED

Item	A	B	C
Length	460 ft.	443 ft.	423 ft.
Breadth	58 ft.	62.3 ft.	60.3 ft.
Depth	35.25 ft.	34.83 ft.	38 ft.
Draft	28 ft.	28 ft.	30 ft. 4 in.
Coefficient	0.791	0.765	0.754
Displacement	16,900	16,900	16,660
H. P.	3,300	3,270	3,250
Cost of hull	100	100	94

CONCLUSIONS

V

In vessels of $\frac{V}{\sqrt{L}}$ up to about 0.65, and trading generally

in smooth water:

- (1) It is an advantage to increase beam, if depth and draft can also be increased.
- (2) It is no advantage to shorten and broaden a vessel, if the draft is not increased.
- (3) It is no disadvantage to increase beam, if necessary for stability.
- (4) Increased beam does not involve reduced speed nor increased power nor increased cost, if displacement is unchanged.
- (5) A minimum depth of channel of 32 feet should be provided at all important seaports.

Appendix

In estimating the comparative horsepowers for the vessels considered it was necessary that some simple tables should be available which would take account of the various dimensions, proportions and speeds involved. After examination, it was decided to try to extend and project the curves given in Taylor's *Speed and Power of Ships* so that they might be used for the assumed cargo vessels. This involved a series of cross curves and an alteration in the method of setting out; but the result is a direct discernment of comparative indicated horsepower for widely varying vessels, and the tables are included here in the belief that they may be of assistance to designers when comparative horsepowers are required. In their application to several known vessels of good form the horsepowers obtained from the tables have closely approximated those installed in the vessels. The formulæ are:

- (1) Wetted surface = $B\sqrt{\Delta L}$.
- (2) Frictional resistance in pounds = $A B C \Delta$.
- (3) Skin horsepower = Frictional resistance $\times V \times 0.0030707$.
- (4) Residuary resistance in pounds = $D \Delta$.
- (5) Residuary horsepower = Residuary resistance $\times V \times 0.0030707$.
- (6) Indicated horsepower = 2 (skin horsepower + residuary horsepower).

TABLE A—FRICTIONAL RESISTANCE FOR 400-FOOT VESSEL—POUNDS PER TON DISPLACEMENT

V	Displacement $\div (L/100)^3$						
$\sqrt{L}$	140	160	180	200	220	240	260
0.65	0.209	0.196	0.184	0.175	0.168	0.163	0.157
0.64	0.203	0.190	0.179	0.170	0.163	0.158	0.153
0.63	0.197	0.184	0.174	0.165	0.158	0.154	0.149
0.62	0.191	0.179	0.169	0.160	0.154	0.150	0.145
0.61	0.185	0.174	0.164	0.156	0.150	0.146	0.141
0.60	0.180	0.169	0.159	0.152	0.146	0.142	0.137
0.59	0.175	0.164	0.154	0.148	0.142	0.138	0.133
0.58	0.170	0.159	0.149	0.144	0.138	0.134	0.129
0.57	0.165	0.154	0.144	0.140	0.134	0.130	0.125
0.56	0.160	0.149	0.140	0.136	0.130	0.126	0.121
0.55	0.155	0.144	0.136	0.132	0.126	0.122	0.117
0.54	0.150	0.139	0.132	0.128	0.122	0.118	0.113
0.53	0.145	0.135	0.128	0.124	0.118	0.114	0.110
0.52	0.140	0.131	0.124	0.120	0.114	0.110	0.107
0.51	0.135	0.127	0.120	0.116	0.110	0.107	0.104
0.50	0.130	0.123	0.116	0.112	0.106	0.104	0.101

TABLE B—FRICTIONAL RESISTANCE. CORRECTION FOR RATIO BREADTH DRAFT

B	Midship Section Coefficient			
d	0.99	0.98	0.97	0.96
1.8	17.60	17.32	17.06	16.87
1.9	17.38	17.10	16.86	16.66
2.0	17.17	16.89	16.66	16.46
2.1	16.97	16.69	16.47	16.27
2.2	16.78	16.50	16.28	16.09
2.3	16.60	16.32	16.10	15.92
2.4	16.43	16.15	15.92	15.76
2.5	16.27	15.99	15.75	15.61

TABLE C—FRICTIONAL RESISTANCE. CORRECTION FOR LENGTH

Length	300 ft.	320 ft.	340 ft.	360 ft.	380 ft.	400 ft.
Coefficient	1.0410	1.0308	1.0217	1.0136	1.0064	1.0000
Length	400 ft.	420 ft.	440 ft.	460 ft.	480 ft.	500 ft.
Coefficient	1.0000	0.9943	0.9892	0.9846	0.9804	0.9765

TABLE D—RESIDUARY RESISTANCE. POUNDS PER TON OF DISPLACEMENT

V	Breadth $\div$ Draft								
$\sqrt{L}$	Prismatic Coefficient	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
0.64	0.82	1.26	1.31	1.36	1.41	1.46	1.51	1.56	1.61
	0.80	1.16	1.20	1.24	1.29	1.33	1.37	1.42	1.47
	0.78	1.07	1.12	1.16	1.20	1.24	1.28	1.32	1.36
	0.76	0.98	1.02	1.06	1.10	1.14	1.18	1.22	1.26
	0.74	0.91	0.94	0.97	1.00	1.04	1.08	1.12	1.16
0.62	0.72	0.84	0.87	0.90	0.93	0.96	0.99	1.03	1.07
	0.82	1.04	1.09	1.14	1.19	1.24	1.29	1.34	1.38
	0.80	0.97	1.01	1.05	1.09	1.13	1.18	1.23	1.28
	0.78	0.90	0.94	0.98	1.02	1.06	1.10	1.15	1.20
	0.76	0.84	0.87	0.90	0.94	0.98	1.02	1.06	1.10
0.60	0.74	0.78	0.81	0.84	0.87	0.91	0.95	0.99	1.03
	0.72	0.72	0.75	0.78	0.81	0.84	0.87	0.90	0.93
	0.82	0.90	0.94	0.98	1.02	1.07	1.12	1.17	1.23
	0.80	0.84	0.88	0.92	0.96	1.00	1.04	1.08	1.12
	0.78	0.78	0.82	0.86	0.90	0.94	0.98	1.02	1.06
0.58	0.76	0.73	0.76	0.79	0.82	0.86	0.90	0.94	0.98
	0.74	0.68	0.71	0.74	0.77	0.80	0.83	0.86	0.90
	0.72	0.63	0.65	0.68	0.71	0.74	0.77	0.80	0.83
	0.82	0.78	0.82	0.86	0.90	0.94	0.98	1.02	1.06
	0.80	0.73	0.76	0.79	0.83	0.87	0.91	0.95	0.99
0.56	0.78	0.69	0.72	0.75	0.78	0.81	0.85	0.89	0.93
	0.76	0.65	0.68	0.71	0.74	0.77	0.80	0.83	0.86
	0.74	0.60	0.62	0.64	0.67	0.70	0.73	0.76	0.79
	0.72	0.55	0.57	0.59	0.62	0.65	0.68	0.71	0.74
	0.82	0.66	0.69	0.72	0.76	0.80	0.84	0.88	0.92
0.54	0.80	0.61	0.64	0.67	0.70	0.74	0.78	0.82	0.86
	0.78	0.57	0.60	0.63	0.66	0.69	0.72	0.76	0.80
	0.76	0.53	0.56	0.59	0.62	0.65	0.68	0.71	0.74
	0.74	0.50	0.52	0.54	0.57	0.60	0.63	0.66	0.69
	0.72	0.46	0.48	0.50	0.52	0.55	0.58	0.61	0.64
0.52	0.82	0.53	0.56	0.59	0.63	0.67	0.71	0.75	0.79
	0.80	0.50	0.53	0.56	0.59	0.62	0.66	0.70	0.74
	0.78	0.47	0.50	0.53	0.56	0.59	0.62	0.65	0.68
	0.76	0.44	0.46	0.48	0.51	0.54	0.57	0.60	0.63
	0.74	0.41	0.43	0.45	0.47	0.50	0.53	0.56	0.59
0.50	0.72	0.39	0.41	0.43	0.45	0.47	0.49	0.51	0.54
	0.82	0.44	0.47	0.50	0.53	0.56	0.59	0.63	0.67
	0.80	0.40	0.43	0.47	0.50	0.53	0.56	0.59	0.62
	0.78	0.38	0.40	0.43	0.46	0.49	0.52	0.55	0.58
	0.76	0.35	0.37	0.39	0.42	0.45	0.48	0.51	0.54
0.48	0.74	0.32	0.34	0.36	0.38	0.40	0.43	0.46	0.49
	0.72	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44
	0.82	0.34	0.37	0.40	0.43	0.46	0.49	0.52	0.56
	0.80	0.31	0.34	0.37	0.40	0.43	0.46	0.49	0.52
	0.78	0.29	0.31	0.33	0.36	0.39	0.42	0.45	0.48
0.46	0.76	0.27	0.29	0.31	0.33	0.35	0.38	0.41	0.44
	0.74	0.25	0.27	0.29	0.31	0.33	0.35	0.37	0.39
	0.72	0.22	0.24	0.26	0.28	0.31	0.32	0.34	0.36

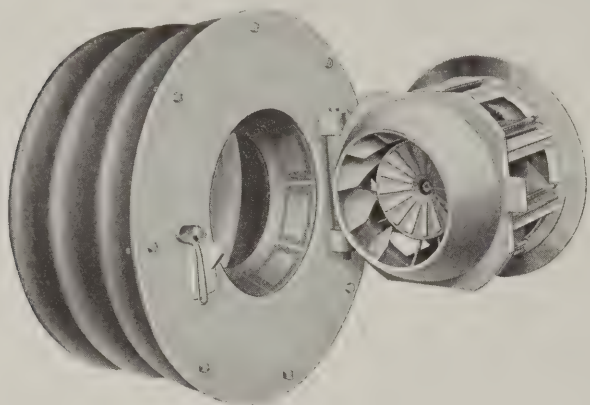
Oil Burner for Scotch Boilers

THE Babcock and Wilcox Company, New York, has adapted its latest type mechanical oil burner, the "San Diego," designed for use on Babcock and Wilcox watertube boilers, for service in the furnaces of Scotch marine boilers.

This burner is built according to the same general design as all of the various types of burners produced by the Babcock and Wilcox Company. Its size and proportions, however, are made to conform to Scotch boiler burner conditions. The "San Diego" burner is hinged to the front plate of the furnace and the simple operation of breaking a single pipe

joint and dropping a latch enables the operator to swing out the entire burner and register whenever desired, thus providing free access to the furnace.

Several installations of this burner have already been made on Scotch boilers. The operating results reported indicate



"San Diego" Oil Burner Arranged for Installation on Scotch Boiler

high efficiency, flexibility and ease of operation. On certain installations where "San Diego" burners have replaced other equipment fuel savings as high as 15 percent have been claimed, the oil burning without smoke and with low stack temperature.

Special Type Multiple Drill for Plates

THE accompanying illustration shows a special multiple drilling machine recently built by the Niles-Bement-Pond Company, 111 Broadway, New York, for the drilling, counterboring and tapping of steel plates.

The machine is made up of two double-webbed steel plate girders supported 8 feet 10 inches above the floor by cast-

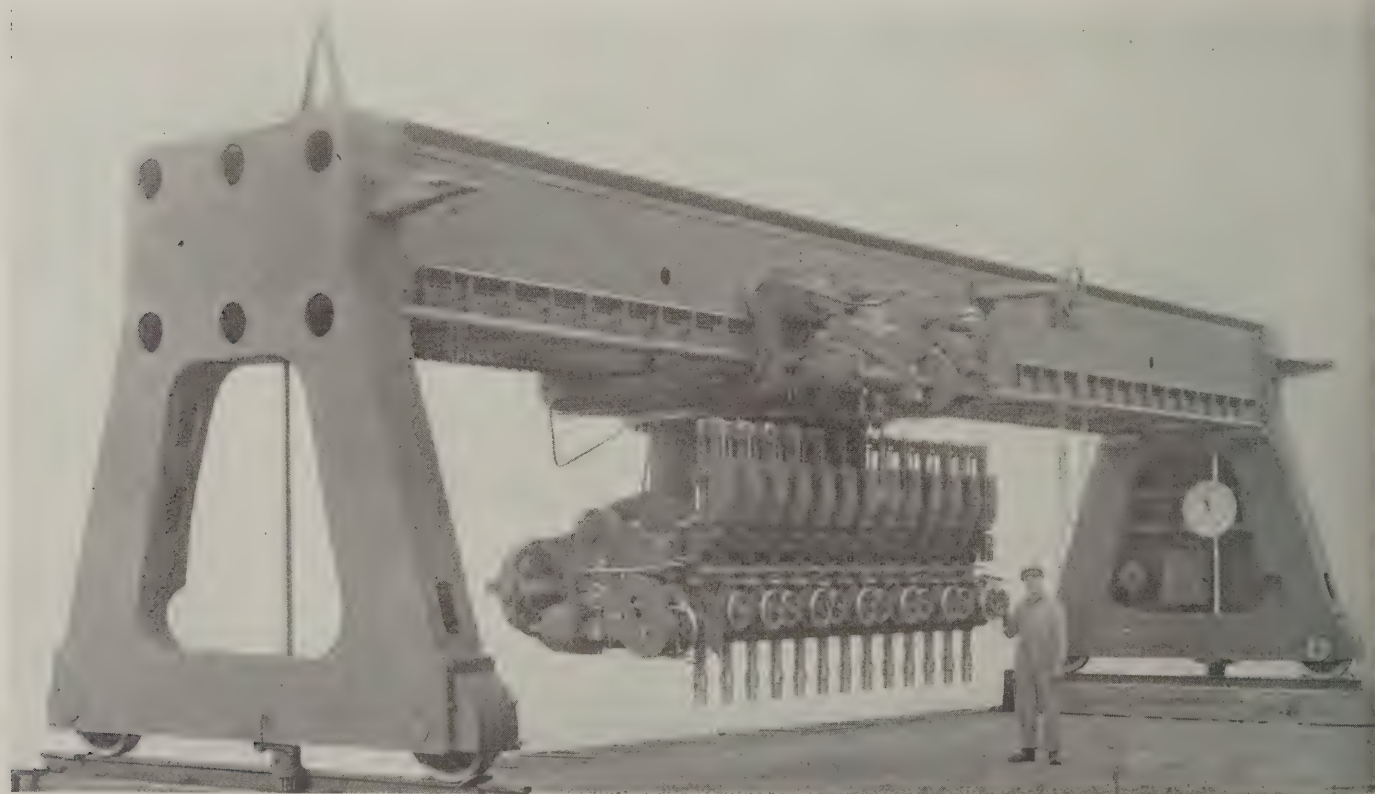
iron housings placed 44 feet apart. A carriage on wheels, suspended as shown, is arranged to travel the length of the girders, and carries a cross-rail having 13 adjustable drill heads. The machine is mounted on wheels and travels on tracks on the shop floor, being driven by means of a 10 horsepower motor.

The spindles are driven by a 50 horsepower direct current motor mounted on the carriage. Spindle speeds from 120 to 360 revolutions per minute for drilling are provided and, by means of suitable gearing, speeds from 35 to 105 revolutions per minute for tapping. The spindles are 2 inches in diameter at the driving point and have No. 5 Morse sockets. They have a vertical adjustment of 13 inches. The center distances between consecutive spindles are 8 inches minimum, the maximum distance between the outside spindles being 12 feet 8 inches. Suitable spindle feeds are provided and each spindle has an independent feed clutch to permit disengaging one or more of the drills while the others are in operation.

The cross rail in which the 13 drill heads are mounted is pivoted on the carriage which permits swiveling a full revolution, a feature intended to enable the drilling of holes along the edges of plates, in any direction. A constant-speed reversible motor is provided for revolving the cross rail on the carriage and traveling the carriage on the girders, hand movement by ratchet being also provided for the cross rail and carriage.

Graduated scales for setting the drill heads are included and also adequate clamping facilities for the carriage and cross rail. All controls are placed in a position convenient for the operator.

J. T. EASON and F. F. Drysdale, who were formerly with the Supply and Sales Division of the Shipping Board and in charge of the immense stocks of shipbuilding equipment at Hog Island, have organized the Standard Steam Winch & Hoist Company, Perry Building, Philadelphia, Pa., and 100 Broadway, N. Y., which will deal in deck equipment.

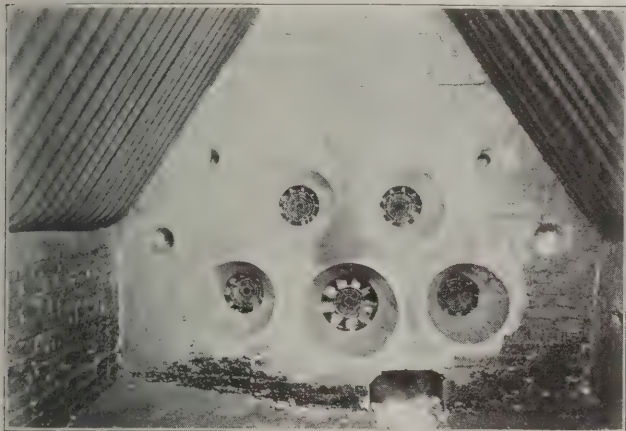


Niles-Bement-Pond Machine for Drilling, Counterboring and Tapping Steel Plates

Long-Lived Burner Ring Refractory

IN the furnaces of oil-burning vessels trouble often develops at the burner ring. The flame here is so hot that it finds the cracks between laid-up fire brick. As a result, the bricks crack, crumble and, finally, drop out altogether. The boiler must then be taken off the line while furnace repairs are being made.

This trouble can be obviated, it is claimed, by the use of Plibrico furnace lining which is a refractory, plastic furnace lining that is applied in unbaked form by anyone who can

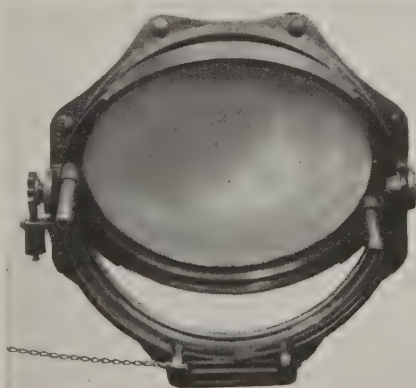


Plibrico Furnace Lining Applied to Burner Rings

use a mallet and trowel. When heat is applied it is vitrified and baked, to form a rock-like, airtight and gastight lining that is resistant to temperatures to 3,100 degrees F. The Jointless Fire Brick Company, 1130-1150 Clay Street, Chicago, Ill., manufacturers of Plibrico, say that when used in connection with burner rings on private and government owned ships, it has outlasted laid up fire brick two to four times.

Watertight Metallic Joint Features French Port Light

IN the new 75-S port light produced by the Sté. Anonyme des Ateliers et Chantiers de La Loire, Nantes, France, the principal feature is the elimination of rubber or metallic packing between the fixed frame and glass holder or dead light and holder in providing a watertight joint. The pressure on the joint is automatically limited to the exact point of watertightness. The basic principle of the port light is that of a cock plug working in its socket. The actuating mechanism of the device is similar to the breach of a field gun in a somewhat simplified form.



Watertight Port Light in Open Position

The 75-S port light may be supplied with an inside dead light fitted with a metallic joint or a non-watertight outside dead light or with both. The port light may be mounted so as to open either on the right or the

left side. A safety device is also provided to prevent the inopportune opening of the port light.

British Lifeboat Equipped with System of Manual Propulsion

A HAND propelling gear for lifeboats has been developed by I. R. Fleming and Company, Liverpool, England, which consists of a series of vertical levers connected at the lower ends to a fore-and-aft rod at either side of the boat under the thwarts. The fore-and-aft rods are in turn connected at the after end to connecting rods attached to crank disks fitted to a thwartship shaft; on this shaft, which is placed in the stern sheets, is a wheel geared to the propeller shaft. In connection with the thwartship shaft is a reversing gear. The boat is propelled by the passengers or members of the crew who move the vertical levers backwards and forwards thus setting the cranks in motion and thus the propeller shaft. The entire mechanism is encased but is readily accessible for inspection.

The Board of Trade has approved this type of propelling gear and when installed in a boat requires only 50 percent of the number of oars in the equipment.

High Power Marine Signals for Motor Craft

AN audible air-driven marine signal for yachts, cruisers, fishing vessels, motorships and the like is being produced by the American Strombos Company, Inc., Philadelphia, Pa. In the Strombos signal the production of sound is unlike that of any other device or instrument. The sound is produced by the emission through the agency of a specially designed air chamber and the valve action of the diaphragm of sharp individual blasts of air which, occurring with great frequency, set in longitudinal vibration the column of air in the projector; the resulting tone is of great power and penetrating quality.

The signal may be mounted in a horizontal or vertical position and connected to an existing air supply or to a thermo compressor system supplied by the company, which is fitted to the priming cup of one of the engine cylinders and compresses air in a steel reservoir. About 15 pounds air pressure is required to operate the horn but it will work on pressures up to 100 pounds.

The Strombos signal is operated by a lever or valve at the point of installation or by a remote electric push button controlling an electric valve.



Strombos Triplex Type Signal Installed on Motorship William Penn

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Rule for Estimating Amount of Fuel Oil in Double Bottom Tanks

Q. (1179).—Please give me a rule for estimating the amount of fuel oil in double bottom tanks according to the drag of the ship when you know the amount if ship had no drag. R. J. F.

A. (1179).—Let M be the fore and aft moment about the transverse axis through the sounding tube of the horizontal section of the tank.

Let L be the length between the draft gages or draft marks, whichever are used, for determining the trim of the vessel.

If M and L are expressed in foot units, then the following formula will give the increase or decrease in gallons due to one foot change in trim:

$$\frac{M}{L} \times 7.48$$

In using this formula it is customary to neglect the volume of the structure in the tank, as the error will be inappreciable considering the entire contents. On the above basis a curve is plotted for each tank showing the increase or decrease in capacity due to one foot change of trim of the vessel for the depth of oil read from the sounding tube. For the ordinary inner bottom tank this formula will give a constant correction for usual trims for varying depths of oil except as the tank becomes nearly full or nearly empty when the horizontal section of the tank (referred to above) cannot be used without modification in obtaining M .

How to Calculate Tank Capacities

Q. (1184).—Please inform me as to the best method of ascertaining the capacities of tanks, water or oil, on shipboard.

A. (1184).—The method at present followed by the United States Navy Department is to calculate tank capacities. The calculations are based upon the final plans of the vessels and may be made either by means of the usual rules of integration or by the aid of an integrator. These calculations are so worked out that the results may be plotted as capacity curves showing gallons and tons for feet depth of liquid. Allowance is made for obstructions.

Formerly tanks were calibrated by means of fresh water and standardized measuring tanks fitted with supply and outlet pipes with gate valves and outlets for hose. Every precaution was taken to avoid leaks, air pockets, sharp turns in leads, etc., to insure the tanks being completely filled and to allow for the effect of temperature variation. The results obtained were recorded in the form of curves as above described.

When there are a large number of tanks in a ship, as in the case of a modern capital ship, it is much less expensive

and sufficiently accurate to calculate capacities as in the method first described.

Shrinking Cast Iron Couplings on Steel Shafts

Q. (1185).—Please give me all the information you can in reference to shrinking cast iron couplings on steel shafts. How much larger should the shaft be than the bore of the coupling? Will the same difference apply to large and small shafts? What amount of pressure will be required to draw the coupling, if properly shrunk on shafts of various sizes? What is a good rule for determining the sizes of keys to use? How would you secure a cast iron coupling on a bronze tail shaft?—Engineer.

A. (1185).—The allowance for shrinkage fits varies with the shape, distribution and thickness of the metal around the hole in the part to be shrunk on. This allowance is often the same as for forced fits. The choice as to whether a shrunk or forced fit should be used depends many times upon the size of the parts and the difficulty in handling them.

The following information is taken from Mark's Mechanical Engineers Handbook, page 687, from which the permissible allowances may be determined:

Maximum fibre stress in the hub (pounds per square inch) = $10,000 Kd$, where d = allowance in inches per inch of diameter of hole, m = thickness of hub $\div$ diameter of bore and K = constant having the following values:

	For $m = 0.0$	0.1	0.2	0.3	0.4	0.5	1.0	1.5	2	∞
K (steel hub)	2790	2400	2110	1900	1820	1750	1550	1480	1440	1390
K (cast iron hub)	1400	1250	1150	1070	1030	1000	917	889	867	846

A good rule for a moderate forced fit such as is usually used for a coupling on its shaft is that the shaft shall be 0.0005 inch per inch of diameter larger than the coupling hole.

This rule applies to all diameters of shaft.

Tests have shown that the amount of pressure required to draw a shrinkage fit is about 3.66 times as great as for a forced fit for the same shaft diameters and same allowances as to fit. The pull necessary to withdraw a forced fit may be calculated from the formula

$$P = \frac{250 \times A \times a}{D^{1.65}}$$

In which A = circumferential area of the shaft within the coupling; a = total allowance in inches; D = diameter of the shaft within the coupling; P = load required in tons to withdraw the shaft regardless as to whether the coupling be of steel or cast iron.

The following rule for proportioning keys may be taken as good practice:

- d = diameter of shaft.
- b = breadth of key = $\frac{3}{4}d + \frac{1}{8}$ inch.
- t = thickness of key = $\frac{1}{2}b$.
- t_1 = depth of key way in hub = $0.3b$.
- t_2 = depth of key way in shaft = $0.2b$.

A cast iron coupling should go on a bronze shaft with a moderate forced fit and be secured by one or more keys, the number depending upon the necessary key length required to keep within safe shearing and crushing stress. The keys should be so designed as to carry the entire turning load, no account being taken of the holding power of the forced fit.

Calculations for Cooling Surface of Condenser

Q. (1192).—What is a good rule for determining the amount of cooling surface (surface condenser) for single, compound and triple expansion engines? How do you figure cooling surface of a surface condenser?

Q. (1192).—There are many things entering into the design of a surface condenser, chief among which are temperature of injection, vacuum desired, velocity of water through tubes and pounds of exhaust steam to be handled per hour, which complicate the problem to a point where a rule of thumb is too rough to be used for design purposes. The statement that a condenser contains a certain number of square feet of cooling surface means very little unless it is properly proportioned as to area through tubes per pass and length of tubes.

In order to explain the method used in proportioning a condenser, values will be assumed and an actual case worked out to fulfil certain given requirements.

W = total pounds of exhaust steam handled per hour = 93,000 (given).

I.H.P. = indicated horsepower of engine = 6200 (given).

S.H.P. = shaft horsepower deduced from I.H.P. = $6200 \times 0.92 = 5703$.

R = pounds of exhaust steam per S.H.P. per hour = $W \div S.H.P. = 93,000 \div 5703 = 16.31$.

H_u = useful B.t.u. per pound of steam per hour = $2545 \div R = 2545 \div 16.31 = 156$.

P = engine steam chest pressure in pounds absolute = 280 (given).

Q = quality of steam corresponding to $P = 99.2$ percent (assumed).

F = latent heat of steam at pressure $P = 817.1$ B.t.u. (from Steam Tables).

h = heat of the liquid corresponding to $P = 386$ B.t.u. (from Steam Tables).

H = heat contents of steam at pressure P and quality

$$Q = \frac{F \times Q}{100} + h = \frac{817.1 \times 99.2}{100} + 386 = 1196 \text{ B.t.u.}$$

H_s = heat contents of steam at vacuum in B.t.u. per pound = $H - H_u = 1196 - 156 = 1040$.

t_o = temperature of injection water = 60° F. (given)

P_s = desired vacuum in inches of mercury = 28 (given)

t_s = temperature corresponding to $P_s = 101^\circ$ F. (from Steam Tables)

t_w = temperature of air pump discharge = 85° F. (assumed)

H_t = heat transferred to cooling water, B. t. u. per pound of steam per hour = $H_s - (t_w - 32) = 1040 - (85 - 32) = 987$.

t_h = temperature head or difference between temperature corresponding to vacuum and temperature of overboard discharge = 20° F. (assumed). This figure would decrease as the temperature of injection increased.

t_i = temperature of overboard discharge = $t_s - t_h = 101^\circ - 20^\circ = 81^\circ$ F.

t_r = temperature rise of cooling water = $t_i - t_o = 81 - 60 = 21^\circ$ F.

L = pounds of cooling water required per pound of steam per hour = $H_t \div t_r = 987 \div 21 = 47$.

L_t = total pounds of cooling water per hour = $W \times L = 93,000 \times 47 = 4,371,000$.

Tubes to be $\frac{5}{8}$ -inch outside diameter and No. 16 B. W. G. thick.

A^1 = area through each tube in square inches = 0.192.

t_m = mean temperature difference between water and steam =

$$t_r \div \log e \frac{t_s - t_o}{t_s - t_i} = 21 \div \log e \frac{101 - 60}{101 - 81} = 29.26$$

S^1 = cooling surface per foot of length of the tube in square feet = 0.1636.

n = number of water passes = 2 (assumed)

V = velocity of cooling water through tubes in feet per second = 6 (assumed). This value varies anywhere from 2 to 7 feet per second depending upon the type of vessel in which the condenser is to be installed, and the duty of the condenser.

K_o = heat transferred per square foot per hour per degree mean temperature difference = 525 B. t. u. This value varies with the velocity of the water through the tubes and the mean temperature difference between the water and steam; and has been derived from performance of condensers in service.

S = total cooling surface in square feet =

$$\frac{W \times H_t}{K_o \times t_m} = \frac{93,000 \times 987}{525 \times 29.26} = 5,975.$$

A = area through each pass in square feet =

$$\frac{L_t}{230,400 \times V} = \frac{4,371,000}{230,400 \times 6} = 3.161.$$

N = total number of tubes =

$$\frac{A \times 144 \times n}{A^1} = \frac{3.161 \times 144 \times 2}{0.192} = 4,740.$$

Z = distance between tube sheets, feet =

$$\frac{S}{N \times S^1} = \frac{5,975}{4,740 \times 0.1636} = 7.70$$

NEW BOOKS

THE SHIPPING TRADES INDEX. Size, $9\frac{1}{2}$ by 12 inches. Pages, 479. New York, 1922: Anglo American Publishing Company.

This directory of the various trades and lines of industry connected with shipping, including shipowners, shipbuilders and repairers, coal exporters, bunkering contractors, exporters and importers, marine insurance companies, etc., has been published annually in England since 1890.

The book is designed to be a complete directory of the shipping interests of the world but so far it can only be said to have achieved that object for Great Britain. This is the first year that a section has been devoted to America and, while considerable progress has been made, those looking for a complete index in this book of firms in this country connected with the shipping industry will be disappointed. A fair idea of the proportion of American firms listed may be obtained by the fact that 407 pages are devoted to Great Britain and only 73 pages to America.

OBITUARY

DR. S. TERANO, president of the Japanese Society of Naval Architects, died at Tokio, Japan, on January 8. Dr. Terano was a professor in the Engineering College of the Imperial University of Tokio and chairman of the Board of Directors of the Imperial Japanese Corporation.

BENJAMIN FRANKLIN CRESSON, JR., chief engineer of the Port of New York Authority, died in Montclair, N. J., on January 25 after an operation for appendicitis. Mr. Cresson was educated at Lehigh University and at the University of Pennsylvania. He was Deputy Commissioner for Docks in New York from 1909 until 1913, in which year he resigned to become engineer for the New Jersey commission investigating pier line extensions and port conditions. From April, 1914, to April, 1915, he was chief engineer of the New Jersey Harbor Commission. In April, 1916, he was appointed an associate member of the Naval Consulting Board. From 1917 to 1921 he was a member of the board of experts on terminal construction for the New York State Barge Canal; in 1918 he was consulting engineer to the War Board, Port of New York; from April, 1921, until his death, he was chief engineer of the Port of New York Authority and chairman of the Technical Advisory Board.

Colonel John O'Neill Awarded Distinguished Service Medal of Congress

JOHN O'NEILL, assistant general superintendent at the International Mercantile Marine Company's Chelsea piers at New York, has received the Distinguished Service Medal of Congress, awarded for services rendered in the debarkation of troops at New York and the port of Brest during and following the war, at which time he was attached to the engineers, having been mustered out with the rank of lieutenant colonel. The presentation was made at 10 a. m., January 20, at the Officers' Club, Pier 60, North River, by Brig. General George H. Harries, O.R.C., under



Colonel John O'Neill Receiving the Distinguished Service Medal of Congress

whom Colonel O'Neill served. Colonel O'Neill has also received the red ribbon of the Legion of Honor of France. He holds several medals for life saving, both at New York and at Boston, where he formerly worked. On several occasions he has jumped overboard in winter to save a drowning man. His first rescue was in 1904, when he saved a man who had fallen into Boston harbor from the White Star liner *Romanic*. In 1907 he led a rescue party into the forecandle of the steamship *Anglican* when the vessel was filled with fumes from burning sulphur, and assisted in the rescue of several men. In March, 1910, he jumped from the steamship *Megantic* at midnight and held up a drowning man 35 minutes in icy water until help came. In February, 1916, he was three quarters of an hour in freezing water steamship *Colonian*. Mr. O'Neill began life as a stevedore at Liverpool, for the Dominion Line. He enlisted in the army in 1917, and after embarkation work at Newport News was

sent overseas in October in the army transport service with the rank of captain. He assisted in the debarkation of 882,000 soldiers in France, and between the armistice and November 23, 1919, helped embark 1,102,000 men for home. He was mustered out December 22, 1919.

PERSONAL MENTION

H. G. SMITH has been appointed vice-president of the Bethlehem Shipbuilding Corporation, Ltd., in charge of sales with offices at 25 Broadway, New York.

ALFRED GILBERT SMITH, president of the New York and Cuba Mail Steamship Company, has received the nomination for president of the American Steamship Owners' Association. Mr. Smith has been actively engaged in ocean shipping all his life. In 1883 he entered the service of James E. Ward and Company, agents of the New York and Cuba Mail Steamship Company, and served through all the departments. In 1907 he was elected vice-president, general manager and a director of the New York and Cuba Mail Steamship Company and was appointed a member of the executive committee of the board of directors in 1916. Three years later he was elected president of the company to succeed Henry R. Mallory. Mr. Smith is a director of the Atlantic, Gulf and West Indies Steamship Lines, the Clyde Steamship Company, the Mallory Steamship Company, the New York and Porto Rico Steamship Company and the International Shipping Corporation.



A. G. Smith

EDWARD T. FISHWICK has been appointed vice-president in charge of sales, and general sales manager of the Worthington Pump & Machinery Corporation, 115 Broadway, New York.

G. T. BRADLEY, formerly traffic manager of the United States Shipping Board Emergency Fleet Corporation at Baltimore, has been transferred to New York as assistant head of the European and Mediterranean Trades Division.

DONALD F. WASHBURN, former assistant head of the European Trades Division in the Washington office of the United States Shipping Board Emergency Fleet Corporation, has been transferred to Baltimore as traffic manager of the Board.

P. SINCLAIR, assistant to the director of finance, United States Shipping Board Emergency Fleet Corporation, has resigned from this position, his resignation to take effect at the close of the present fiscal year. Mr. Sinclair joined the Emergency Fleet Corporation in April, 1922, and has had charge of the comptroller's department since that time.

D. A. BURKE, at present district comptroller of the United States Shipping Board Emergency Fleet Corporation at Philadelphia, will succeed P. Sinclair, assistant to the director of finance of the United States Shipping Board, Washington, D. C., whose resignation has just been announced. Mr. Burke will immediately be associated with Mr. Sinclair in the management of the comptroller's department, assuming complete control when Mr. Sinclair's services with the Board will have been completed at the end of the fiscal year.

Shipbuilding, Reconditioning and Operation

Port Expansion, Passenger and Freight Activities and Other
Notes of Interest in All Branches of the Marine Industry

Year's Activities Under Way

THE autumn of 1924 will see the Clyde Steamship Line equipped with two new ships for New York and Florida service, according to a statement made by H. H. Raymond, who was a guest of honor at a recent session of the Civitan Club in the Seminole Hotel, Jacksonville, Fla. Mr. Raymond, who was called on for a talk, announced that a naval architect is now making the specifications and that those and the plans will be submitted to the company in April of this year, and that these two ships will be ready for the direct from New York to Jacksonville service in the fall of 1924.

The North Atlantic & Western Steamship Company, commonly known as the Nawsco Line, and engaged in coast-wise service between the Atlantic and Pacific Coast ports of the United States, looks forward with confidence to a record-breaking year as far as domestic business in the United States is concerned. The company is gradually putting itself in shape to be able to buy tonnage, presumably from the Emergency Fleet Corporation, with the ultimate purpose of converting such vessels from steam to Diesel propulsion. It is through the medium of internal combustion engines that the company hopes to reduce its operating expenses.

The United States Engineer Office, Galveston, Tex., which at present maintains and operates one seagoing hopper dredge and six hydraulic pipe line dredges, three derrick barges, one steam seagoing tug and about twenty smaller internal combustion drive tugs and launches, with three large barges working by contract, has an unexpended balance available for 1923 of approximately \$2,275,000. For the replacement of wornout pumps the office will probably purchase during the year two 20-inch sand pumps. About \$250,000 per month is being expended mostly for dredging operations.

The Engineer Office, for the First District, New York City, is understood to be considering the possibility of converting one or two dredges from coal to oil burning during this year, while the office at Jacksonville, Fla., is planning to construct three steel barges, each 80 feet by 26 feet by 5 feet for use of the dredge *Mallery*.

Newport News Co. Low Bidder For Four Dump Scows

WITH a price of \$190,000 and a time figure of 45 days, the Newport News Shipbuilding & Dry Dock Company, of Newport News, Va., submitted the lowest tender for the construction and delivery of four steel dump scows complete, at the opening of bids at noon, on January 15, by Colonel Earl I. Brown, Corps of Engineers, U. S. Army, at Philadelphia, Pa.

The boats are to have an overall length of 144 feet, width overall 37 feet, depth of deck to inside 11 feet 8 inches, and are to be of the 7-pocket bottom dump type, each of about 850 cubic yards total capacity. Nine companies bid for the work.

West Palm Beach to Vote on \$250,000 Terminal Issue

THE City of West Palm Beach, Fla., is about to vote on bonds for the purchase and improvements of terminal locks and other accessories and a cross state railroad. The amount of the issue will be \$250,000 and the chances are strong that it will carry. The date of the election is February 13.

Ten Ships Under Order Abroad for the Eastern Steamship Company, of Canada; Also Five Canadian Lakers

TEN vessels are being placed to the order of Mr. A. B. Mackay, according to information received by MARINE ENGINEERING AND SHIPPING AGE, for the Eastern Steamship Company, of Canada, as follows:

Two vessels from J. S. White & Company, East Cowes.

Two vessels from Furness Steamship Company, Haverton Hill.

Two vessels from Napier & Miller, Old Kilpatrick.

Two vessels from Earles Shipbuilding Company, Hull.

One vessel from Cammel Laird & Company, Birkenhead.

One vessel from J. I. Thornycroft & Company, Southampton.

It is understood that the order for these vessels were negotiated for through a firm of shipbrokers, Messrs. Vogt & Maguire, in Liverpool.

This order has been placed by Messrs. H. E. Moss & Company, Liverpool, shipbrokers, who have, it is understood, also placed contracts for two steamers of a similar description with other builders on the North East Coast.

Quarter Million Dollar Contract for Two Tugs Awarded Tebo Plant; Will Be of Steel and Oil Burning

THE Tebo Yacht & Basin Company, of the Todd Shipyards Corporation, has been awarded a contract for the construction of two steel oil burning tugboats for the Standard Transportation Company, 26 Broadway, New York. Deliveries are scheduled for June and July. It is under-

stood that the total cost will be close to \$225,000.

Each vessel will have a length overall of 105 feet 9 inches, breadth molded 24 feet, depth molded 12 feet 9 inches. Propulsion will be by reciprocating engines developing about 800 horsepower.

Two Diesel Lightships Planned

THE construction of two light vessels propelled by Diesel engines and equipped throughout with electrically driven auxiliaries, is the latest project contemplated by the Bureau of Lighthouses, of the Department of Commerce, Washington, D. C.

According to information obtained by MARINE ENGINEERING AND SHIPPING AGE, the desire to build a light vessel capable of remaining on station for one whole year without re-fueling at sea led the Bureau to the consideration of fuel oil burning instead of coal. Its investigations developed the following advantages for fuel oil: (1) less bunker space required; (2) smaller fireroom force; (3) less corrosion to ship in bunkers; (4) more flexible in maintaining low head of steam; with the following disadvantages: (1) bunkers more expensive to build; (2) dangers of leaks due to working of ship in exposed stations necessitating extreme precautions in designing connections and fastening, riveting, calking, etc.; (3) more machinery in boiler room to maintain, necessitating duplicate installation; (4) necessity of educating present personnel to new type of firing.

After consideration, it was decided to build *Light Vessel 105* adapted for oil burning. *Light Vessels 106-110*, later contracted for, were made oil burning based largely on the performance of *Light Vessel 105*. Diesel engines were then considered for this service and after investigation as to flexibility of control and economy in operation and having overcome the disadvantages of carrying fuel oil in bulk, the construction of two new Diesel drive ships, *Light Vessels 111 and 112*, equipped complete with electric auxiliaries, is planned.

Three and a Quarter Millions Required to Meet Vessel Needs of U. S. Lighthouse Service

THE increasing need of additions to the vessels of the Lighthouse Service, involving an expenditure of approximately \$3,260,000 during the next three years, is pointed out in the annual report of G. R. Putnam, Commissioner of Lighthouses, to the Secretary of Commerce. In referring to the light vessel situation, new construction and reconditioning needs, etc., the Commissioner states:

NEED FOR REPLACEMENT

The annual reports for 1919, 1920, and 1921 gave full statements of the urgent need for the construction of additional vessels for the Lighthouse Service to replace those worn out in service, those lost through various casualties, and to meet the considerable growth of the service. The duty of the two types of vessels, tenders for buoy work and supply purposes, and light vessels for floating lighthouses, was explained, as well as the severe usage and hazardous service to which these vessels are exposed.

These conditions have been alleviated for the present with regard to large seagoing tenders by the transfer to this service from the War Department of six large mine-planting vessels.

The need for new light vessels is increasing. There are no vessels in other departments or the Shipping Board available for transfer which are suitable for use as light vessels, due to their special design and construction requirements. To maintain the serviceability of the light vessels, it is necessary to construct an average of two each year. Since 1910, and particularly since the beginning of war conditions, there has been a considerable deficiency in the building of vessels sufficient to keep up this program.

Of the light vessels now in use, 22 are more than 30 years old, and 11 are over 50 years old. Many of the lightships are not in condition to be safely placed on exposed stations. The cost of repairs and overhaul becomes so heavy that it is not economical to keep in commission vessels after they have reached a reasonable limit of usefulness. The effect of continuing the use of these old ves-

sels is often a greatly diminished output of work with the same or greater cost of operation and upkeep. Of more importance than the question of efficient and economical operation, however, is that of safeguarding life. Both lighthouse tenders and lightships are engaged on hazardous duty, and their officers and crews should not be required to serve on vessels which have passed a reasonable limit of usefulness, nor can the Lighthouse Service properly perform its part in the safeguarding of life and property on the navigable waters of this country without necessary vessel equipment.

Congress, by the act of June 5, 1920, after full hearings, authorized a building program for vessels for the Lighthouse Service of \$5,000,000, and an appropriation of \$1,000,000 of this amount was made in the act of March 4, 1921. Under this and previous appropriations the following vessels are now under construction: Light vessels to replace No. 20, Cross Rip, Mass., No. 3, Handkerchief, Mass., No. 11, Scotland, N. J., No. 34, Charleston, S. C., and No. 43, relief, eighth district; tender to replace *Goldenrod*, fourteenth district. On the last contract much lower bids were received than for a number of years, and this appears to be a favorable time for vessel construction. No further vessels can be built, however, under available appropriations. During the fiscal year

Examinations For Draftsmen

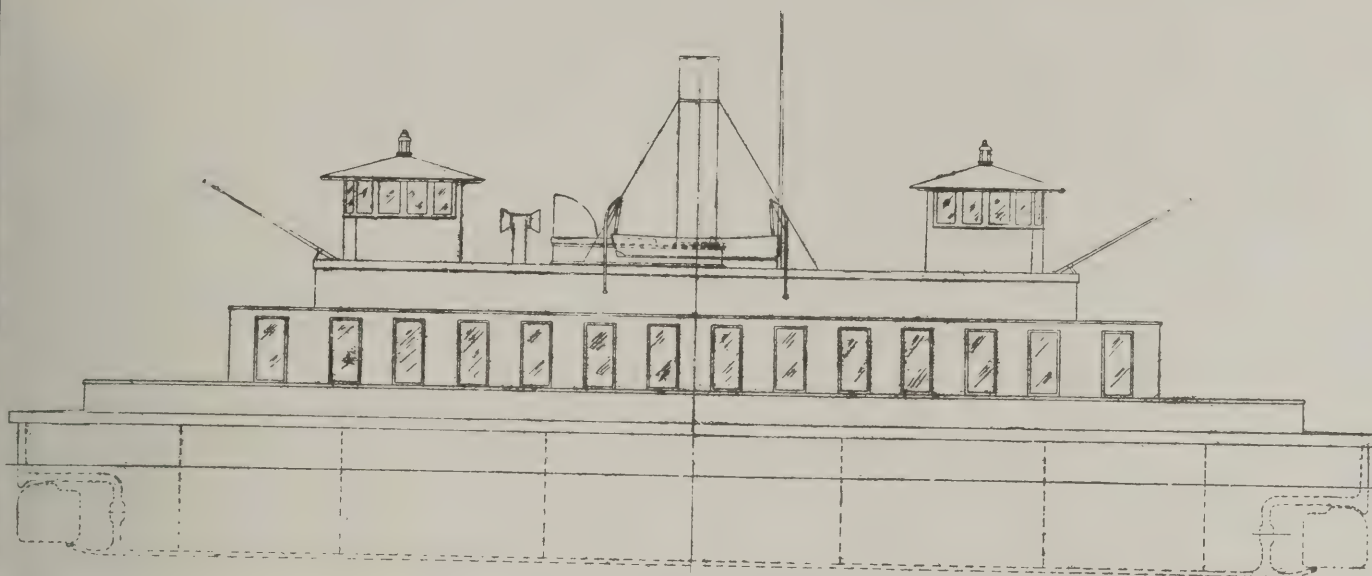
THE United States Civil Service Commission announces an open competitive examination for ship draftsmen, Grade A (small boats). Vacancies in the Bureau of Construction and Repair, Navy Department, Washington, D. C., at \$6.80 to \$8.80 per diem, plus bonus. Appointees at annual compensation of \$2,500 or less, whose services are satisfactory, may be allowed the increase granted by Congress of \$20 a month. Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.; the Secretary of the United States Civil Service Board, Customhouse, Boston, Mass., New York, N. Y., New Orleans, La., and postoffices in the principal cities.

three tenders and four light vessels which had been condemned as unfit for further service were sold, the very small prices obtained indicating their extremely worn-out and unserviceable condition.

From careful estimates and examinations as to the condition and further serviceability of vessels of the Lighthouse Service it is found that, in addition to those provided for by vessels now building, 14 light vessels and 5 tenders should be replaced within the next five years. As it will require from two to three years after appropriation is made before vessels are available for service, funds should be provided now for 8 of these vessels, being those more urgently needed, and first named in the following list:

ADDITIONAL VESSELS FOR WHICH APPROPRIATION IS NOW NECESSARY OR SHOULD BE AVAILABLE WITHIN THE NEXT THREE YEARS.

Light vessel to replace No. 4, relief, second district, second class.....	\$200,000
Light vessel to replace No. 70, San Francisco, Calif., second class.....	200,000
Tender to replace <i>Oleander</i> , fifteenth district, river class (special)	150,000
Light vessel to replace No. 57, Grays Reef, Mich., third class.....	150,000
Light vessel to replace No. 56, North Manitou Shoal, Mich., third class.....	150,000
Light vessel to replace No. 51, relief, third district, second class completion of vessel)	90,000
Recondition mine planter to replace <i>Lilac</i> , ninth district.....	35,000
Recondition mine planter to replace <i>Madrona</i> , eighteenth district.....	35,000
Light vessel to replace No. 5, Stone Horse Shoal, Mass., second class.....	200,000
Light vessel to replace No. 68, Fire Island, N. Y., second class.....	200,000
Light vessel to replace No. 69, Overfalls, Del., second class.....	200,000
Tender to replace <i>Holly</i> , fifth district, class B.....	300,000
Tender to replace <i>Arbutus</i> , fifth district, class B.....	300,000
Tender to replace <i>Daisy</i> , third district, class C.....	100,000
Light vessel to replace No. 48, Cornfield Point, Conn., second class.....	200,000
Light vessel to replace No. 1, Martins Industry, S. C., second class.....	200,000
Light vessel to replace No. 60, Eleven Foot Shoal, Mich., third class.....	200,000
Light vessel for Barnegat, N. J., second class.....	200,000
Light vessel for Grays Harbor, Wash., second class.....	150,000



Outboard Profile of Proposed East River Ferries

Plans and Specifications for Eight Ferries to Cost \$1,475,000 Submitted to Estimate Board

Vessels Are to Be Built of Steel Having a Length of 130 Feet
Driven by Twin Screws—Specifications Provide
for Steam Engines With Alternate Bids
for Diesel Installations

PLANS and specifications for the construction of a total of eight ferryboats for New York City, to be built at a total cost of \$1,475,000, have been submitted by Grover A. Whalen, Commissioner of Plant and Structures, to the Board of Estimate and Apportionment, with a request for the authorization of funds. The commissioner requests five new boats to cost about \$925,000, for the Grand Street-Broadway Municipal Ferry Line and for the Union Ferry Lines, which were taken over by the city on December 17, last, and three boats to cost about \$550,000, for the East 92nd Street-Astoria and Clason Point-College Point Ferry Lines.

For these various East River Lines the commissioner plans an all steel boat, having

a length over guard of 130 feet, beam over guards 52 feet, draft 8 feet 6 inches, driven by screw propellers instead of side wheels, with three gangways for vehicles and two cabins, all on one deck. The boats are planned to be driven by high pressure two-cylinder steam engines, but alternate bids will be received for equipment with either double compound steam engines or Diesel engines, direct connected. In the case of the steam installations, oil will be used for fuel instead of coal, the boats being designed to make a speed of 10 miles an hour instead of 5 or 6.

Commissioner Whalen stated that the boats can be operated much more economically than the present ferries, saving not only in repairs and maintenance but in actual operating costs.

Contract Awarded Hildebrand Yard, Kingston, for Construction of Two More Diesel Towboats

THE contract for the construction of two Diesel towboats for the Transmarine Corporation, of 11 Pine Street, New York City, has been awarded the Hildebrand Shipyard, at Kingston, New York. The boats were designed by R. R. Livingston, naval architect and marine engineer, Rector Street, New York, and are duplicates of three boats recently completed by

the same shipyard and which were also designed by Mr. Livingston. It is understood that the contract will involve approximately \$75,000.

The boats will have an overall length of 63 feet, beam 14 feet, draft 7 feet, the propelling machinery of each boat consisting of a 6-cylinder 180 horsepower Nelsco Diesel engine.

Gasoline Ferry Rebuilding; New Boilers in Mate

THE gasoline ferry boat *Pelican* is undergoing a complete rebuilding at the South side dock of the Jacksonville Ferry and Land Company, with the view of placing the craft on the run now being taken care of by the steam ferry *Duval*. The change will only be temporary, states J. N. Cook, manager of the company, the *Pelican* to run while the *Duval* is having new boilers installed.

The deck of the *Pelican* will be renewed, two new cabins built, and a runway for automobiles enlarged.

Ward Works Low For Constructing Dredge Wautaga

THE Charles Ward Engineering Works, Charleston, W. Va., was low bidder for the construction of a 2-cubic yard steel dipper dredge, to take the place of the dredge *Wautaga*, at the opening of bids by United States Engineer Office, Nashville, Tenn., on January 16. The company's price was \$60,574.

The proposed boat is to have an overall length of 108 feet.

New Bulkhead

COMMISSIONER of Docks, Pier A, foot of Battery Place, North River, Manhattan, received sealed bids at 12 o'clock, noon, on Monday, January 22, for the construction of a concrete bulkhead wall along the Harlem River Driveway, between 165th and 193rd Streets. The contract will cost close to \$200,000.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Repair Work, Baltimore, Md.—H. E. Crook Company has been awarded the contract for repair work on the steamer Dallas.

Docked and Overhauled, Mare Island, Cal.—The navy tug Vigilant was taken to the Mare Island Navy Yard for docking and overhauling.

Miscellaneous Repairs, Chester, Pa.—The Shipping Board steamship Chickamauga has been awarded to the Sun Shipbuilding Company for miscellaneous repairs.

Steamship Drydocked, Chester, Pa.—The Shipping Board steamship Bannock was awarded to the Sun Shipyard for drydocking and miscellaneous repairs.

Steamer Purchased, New York.—Steamship Canibas, 9,947 deadweight tons, was bought at auction by the Matson Navigation Company for \$198,100.

General Repairs, Floreffe, Pa.—The steamer Vulcan of the Vesta Coal Company was placed on the marine ways of the company at Floreffe for general repairs.

Japanese to Convert Liners.—All the Nippon Yusen Kaisha liners operating between Yokahama and the Atlantic seaboard of America are to be converted into oil burners.

Collision Damage Repairs, Brooklyn, N. Y.—The Morse Dry Dock & Repair Company was awarded the contract to repair collision damage on the steamship Mexico. Price about \$22,000.

Steamers Sold, New York.—The Shipping Board has sold the ex-Atlantic-Gulf and Pacific steamers Henry S. Grove and Charles H. Cramp to the Argonaut Steamship Corporation of New York.

Tanker Drydocked, New Orleans, La.—The Mexican Petroleum Corporation's tanker Crampton Anderson was placed on the docks of the Jahnke Dry Dock Company for overhauling and repainting.

Contracts Awarded, Philadelphia, Pa.—Cramp Ship and Engine Building Company was awarded the contracts for work on the British tanker Cheyenne and the American schooner Esther K.

Contract Award, New York.—The New York Harbor Dry Dock Company was awarded a contract for repairs to the steamship West Calumb, for which bids were opened on December 21. The price was \$1,278.

Minor Repairs, West Coast.—The Pacific Coast Engineering Works was awarded the contract for replacing the main steam pipe and other minor repairs to the engines of the steamship Bessie Dollar.

Steamer Allocated, New York.—The Shipping Board has allocated to the Cosmopolitan Line the 8,550 deadweight ton steamer Cohasset, for service from New York and Philadelphia to French Atlantic ports.

Repairs and Drydocking, Philadelphia, Pa.—The Pennsylvania State Nautical Schoolship Annapolis has been taken to the League Island Navy Yard for minor repairs and drydocking preparatory to the winter cruise.

Car Float Launched, Camden, N. J.—A car float 340 feet long, built for the Brooklyn Eastern District Terminal Company, was launched at the yards of the New York Shipbuilding Corporation, Camden, N. J.

Repairs, Brooklyn, N. Y.—The Robins plant of the Todd Shipyards Corporation has been awarded the work of repairing the tank steamer Alabama, which recently went aground off the Mexican coast, at a cost of \$77,000.

Steamship Purchased, New York.—The Garland Steamship Line has purchased the steamship West Cavanal, of 8,564 deadweight tons, 410 feet long with a 54-foot beam. Price \$171,000. She will be generally overhauled.

Aero Alarm Contracts.—The Seattle office of the Aero Alarm Company has contracts for the extension of the Aero Alarm System on the steamships President Jackson and President Grant, of the United States Shipping Board.

Repairs to British Steamship, Brooklyn, N. Y.—With a bid of \$66,000, the Morse Drydock and Repair Company has been awarded a contract for repairs to the British steamship Cairndhu, which grounded in the St. Lawrence River.

Schooners Docked, Baltimore, Md.—Schooners Charles G. Gawthrop and W. H. Woodin, purchased by the Maryland Navigation Company from the American Car and Foundry Company, were taken to Baltimore to be fitted out for service.

Steamship Drydocked, Sparrows Point, Md.—Steamer City of Flint, of the Exportation Transportation fleet, was placed on the docks of the Sparrows Point plant of the Bethlehem Shipbuilding Corporation preparatory to loading for Europe.

Two Tugs Sold.—The Shipping Board has sold the 418 gross ton steel ocean type tug Barren Fork to S. A. Guilds, of Charleston, S. C., and the similar type and tonnage tug, Butterfield, to the Newaygo Tug Line, Inc., of Wisconsin Rapids, Wis.

Transport Purchased.—The Robert Dollar Company has purchased the former army transport Dix. This vessel, having served for more than twenty-five years on the Pacific, is expected to be used in the trans-Pacific trade. Price, approximately \$25,000.

Steamer Allocated, Mobile, Ala.—The steamer Westland, of 6,800 deadweight tons, has been allocated by the Shipping Board to the Waterman Steamship Company, of Mobile, Ala., for its Mobile-Liverpool and West Coast United Kingdom ports' service.

Steamers Repaired, San Pedro, Cal.—Steamers El Cicuta, El Abeto and El Cedaro, recently purchased by the Los Angeles Lumber Products Company, were awarded to the Los Angeles Shipbuilding & Dry Dock Corporation yards to be converted to oil burners.

Steamship Purchased, West Coast.—The Alaska Steamship Company has purchased the Shipping Board steamship Delrosa for service between Seattle and Alaskan ports. The vessel can carry 5,000 tons of cargo, is 321 feet long, 46 feet beam and 24.4 feet in depth.

Vessels Drydocked, San Francisco, Cal.—The Bethlehem plant was awarded the following contracts: Asbury Park, drydocked for cleaning and painting; the Yellowstone, cleaning and painting; W. S. Rheem, drydocking; Barge 95, of Standard Oil Company, for survey.

Successful Trials, Pa.—The new passenger and freight steamship Haleakala, built for the Inter-Island Steam Navigation Company of Honolulu by the Sun Shipbuilding Company, Chester, Pa., passed successful trials off the Delaware Capes, exceeding its contract speed of 17½ knots.

New Engines for Coaster, Oakland, Cal.—Two new thirty-five-ton Diesel engines are being installed in the steamer Frank Lynch of the Frank Lynch Lumber Company, of San Diego, by the Crowley shipyard crew at the plant of the Union Construction Company in Oakland.

Contract Awarded, Staten Island, N. Y.—The New York Harbor Dry Dock Company, low bidder with a price of \$38,900, received the contract for alterations and installations on the 353-foot combination passenger and cargo steamer President Arthur, of the United States Shipping Board.

Shipyard Activities, Oakland, Cal.—The Hanlon Shipbuilding and Drydock Company has been awarded the contracts on the following: Lumber carrier Edna Christenson, new tail shaft; steam schooner Necanicum, schooner Resolute and bark Monongahela, general repairs and drydocking.

New Ships Ordered by Canada.—Thirteen steamers, averaging 250 to 300 feet long, have been ordered or are ready to be placed with British shipyards for use on the Great Lakes of Canada and the United States. These boats will be capable of carrying from 90,000 to 100,000 bushels of wheat.

Tankers Drydocked, Galveston, Tex.—The Shipping Board tankers Houma and West Erral were taken to Galveston to be drydocked for overhauling. The tied-up Shipping Board tankers at Orange, Texas, will gradually be withdrawn and brought to Galveston for repairs as the demand for tonnage increases, according to officials.

Sale of Two Lake Type Vessels.—The Shipping Board has sold the lake type steel cargo vessels Lake Gera, of 4,155 deadweight tons and 2,637 gross tons, to the Lone Star Steamship Company, of Galveston, Texas, and the similar type vessel, Lake Pepin, of 2,989 deadweight tons and 1,997 gross tons, to the Hammond Lumber Company, of San Francisco.

Fishing Steamers, Maryland.—A contract has been awarded to M. M. Davis & Son, shipbuilders at Salomons, Calvert County, Md., for the construction of two fishing steamers for fish-products factories at Reedville, Va. One of the vessels is to be 140 feet long, the other 135 feet, the larger of the two to be equipped with two 200-horsepower crude oil engines. Both are to be lighted by electricity.

Vessels Drydocked, West Coast.—The following vessels were reported drydocked: At the Moore Shipbuilding Company, steamers South Coast, Mount Baker, Carolyn Francis and tug Crolone; at the Crowley yards, steamers Admiral Schley, Jephtha, destroyer De Long, subchasers Vaughn and Cygon and barges Crowlet 9 and Napa; at the Bethlehem yard, steamers Vinita, West Jena, Grays Harbor and Acme.

Steamer Reconditioned, San Pedro, Cal.—The Los Angeles Shipbuilding and Dry Dock Corporation was awarded the contract to recondition the steamship Calavai, formerly the United States Army transport Sherman, by the Los Angeles Steamship Company; the work to consist of complete overhauling, entire refitting and refurbishing of all passengers' quarters, and conversion to an oil burner. Estimated cost \$300,000.

Stern Wheel Harbor Boat, Pittsburgh, Pa.—The Marietta Manufacturing Company has received a contract from the Jones & Laughlin Steel Company for the construction of an all-steel stern wheel harbor boat. This boat is to be 64 feet long on deck and 82 feet overall. The boat, which will be engaged in the Pittsburgh-Aliquippa trade after completion, will be of the scow prow type, equipped with a Fairbanks-Morse Diesel oil burning engine of 200-horsepower, with a solid drive shaft.

Steamers Allocated, New York.—The Shipping Board has allocated the 9,789 deadweight ton steamer Waukegan to the Cosmopolitan Shipping Company of New York, for their New York-Philadelphia-French Atlantic service; the steamer Cohasset, 8,500 deadweight tons, to the Black Diamond Steamship Corporation of New York, for their Philadelphia-New York-Antwerp general cargo service, and the steamer Abren, 7,814 deadweight tons, to the Export Steamship Corporation of New York for their New York-Levant general cargo service.

Vessels Awarded for Repairs, New Orleans, La.—The Jahnke Dry Docks, Inc., has been awarded the following contracts: Minor repairs to steamship West Segovia of the Shipping Board, damaged by

fire, repairs consisting principally of replacing a bulged and buckled deck plate, restoring a little woodwork and renewing burned out electrical installations; steamship Blaafjeld, to undergo alterations and repairs; steamship Rajab, for overhauling; and the Tegucigalpa, Vaccaro Brothers Steamship, the barge Chagres and the Mississippi Warrior tow-boat Natchez, for repairs.

SHIPYARDS AND DRYDOCKS

Shipbuilding Plant Sold, Port Wentworth, Ga.—The plant of the Terry Shipbuilding Corporation, at Port Wentworth, has passed into the hands of the Georgia Wool Stock Company and the American Mills International Company, both of Atlanta, at a price of \$506,000.

Shipyards to Be Dismantled, Bristol, Pa.—The yard of the Merchant Shipbuilding Company at Bristol, Pa., is to be discontinued and the ways there dismantled, as a result of concentration of all the shipbuilding activities of the Harriman interests at the single shipyard of William Cramp & Sons' Ship and Engine Building Company, at Philadelphia, according to announcement by R. H. M. Robinson, chairman of the executive committee of the company and president of the Merchant Shipbuilding Company, also a Harriman shipbuilding organization.

Facilities Enlarged, Los Angeles, Cal.—According to announcement by Charles M. Schwab, head of the Bethlehem Steel Corporation, following inspection at Los Angeles Harbor of the Bethlehem Shipyard and Dry Dock Corporation, a larger drydock than the present one now in use and increased shipbuilding facilities will be erected shortly at the Los Angeles yards. Vice-president E. B. Hill, of the Bethlehem concern, who accompanied Schwab on the inspection trip, indicated that the Bethlehem plant there would soon devote greater energy to the manufacturing of Diesel engines.

Crook Company Gets Repair Plant, Baltimore, Md.—The drydocking and repair facilities of the Union Shipbuilding Company have been taken over under a lease by H. E. Crook Company. These additional facilities will be operated in conjunction with the present yard of the Crook Company at Locust Point, Md., and will be used primarily for underwater work, enabling docking of vessels up to 420 feet in length and to handle heavy and light repair work and mechanical installations of every description. A Crandall 10,000 deadweight ton electric railway, along with the rest of the equipment, all entirely new, equips the company with one of the most complete plants of its kind on the Atlantic seaboard. The plant is equipped with three shipbuilding ways and is able to accommodate the largest class of vessels.

PORT IMPROVEMENTS

Grain Elevator, Ft. William, Ont.—Bole Grain Company, Ltd., plans concrete grain elevator. \$500,000.

Grain Elevator, Corpus Christi, Tex.—F. Kell, Wichita Falls, plans concrete grain elevator, \$250,000.

Dredge and Harbor Improvements, Aberdeen, Wash.—\$250,000 has been voted for dredge and harbor improvements.

Grain Elevator, Montreal, Canada.—Montreal Harbor Commissioners plan 10,000,000 bushel grain elevator. Price \$10,000,000. W. L. McDougald, resident.

Wharf and Shed, New Orleans, La.—The Engineering Department, Board of Commissioners, 200 New Court Building, is having plans prepared for a reinforced concrete wharf and shed along Industrial Canal. \$1,400,000.

Wharf Contract, New Orleans, La.—The contract for the reconstruction and rat-proofing of the Robin Street Wharf was let by the dock board to John Riess, New Orleans contractor, on a low bid of \$196,000, work to be completed within 220 days.

Levee, New Orleans, La.—Orleans Levee Board, New Court House Building, has awarded a contract to H. Reynolds, Maison Blanche Building, for a new levee on the left bank of the Mississippi River. Price \$26,801.

Grain Elevator, Owen Sound, Ont.—Owen Sound Elevator Company is having plans prepared for grain elevator, steel and cement, on waterfront. Price \$150,000. R. Patterson, manager. Prices wanted on materials. Private plans.

Harbor Improvement, Midland, Pa.—The General Contracting Corporation received a contract to improve the harbor at the Crucible Steel Company's Midland plant on the Ohio River. About 30,000 cubic yards of material will be removed.

Traveling Crane, San Francisco, Cal.—The contract for furnishing and installing an electric traveling crane in Moccasin Creek Power Plant, Hetch Hetchy Project, was awarded to Pawling & Harneschfeger, 32 Beale street, by the City and County of San Francisco, at a price of \$30,475.

Dock, Warehouse, Etc., New Orleans, La.—Board of Port Commissioners, Suite 200, New Court Building, has had surveys made for dock and warehouse at foot of St. Joseph street, \$400,000; plans are being prepared for wharf apron, heavy timber construction, at foot of Barracks street, \$30,000.

Wharf and Bulkhead, Weymouth (Boston P. O.), Mass.—Edison Electric Illuminating Company, of Boston, 70 State street, Boston, is having preliminary plans prepared for a wharf and bulkhead adjoining proposed power plant, Weymouth. Price \$50,000. Stone & Webster, Inc., 147 Milk street, Boston, architects and engineers.

Two Piers, Virginia.—Two smaller piers will be added to the docking facilities at Old Point by the United States War Department for the accommodation of smaller river and harbor crafts, according to the announcement at the United States Army Engineers' office here. The wharf will be improved also in the project, the entire cost of which will total about \$40,000.

Secretary Weeks has approved tentative plans for the new work, and specifications will be shortly announced. Bids for the job will then be asked of constructive companies.

GOVERNMENT WORK

Dredging, Norfolk, Va.—Specification 4771. Bureau of Yards & Docks, Navy Department, Washington, D. C., plans dredging in Norfolk Harbor.

Barges, Pittsburgh, Pa.—United States Engineer, Pittsburgh, awarded the contract for three steel deck barges to McWilliams Co., Inc., Exchange Building, Memphis, Tenn.; price \$85,082.

Catamarans, Savannah, Ga.—United States Engineer Office awarded the contract for furnishing 25 pontoon catamarans for U. S. dredge Morgan, to Charles Ward Engineering Company, Charleston, West Virginia; price \$22,375.

Dredging, Charleston, S. C.—The Seaboard Dredging Company, Durkee Building, Jacksonville, Fla., was awarded the contract for dredging the western channel and Sampit River, Winyah Bay, by the United States Engineer Office, Charleston. Price \$99,594.

Dredging, Jacksonville, Fla.—The Clark Dredging Company, Miami, has been awarded the contract for dredging in Key West Harbor by the United States Engineer Office, Jacksonville; price \$1.43 per cubic yard; 63,000 cubic yards of dredging.

NEW INCORPORATIONS

The Shamrock Towing Company, of New York, capital \$200,000, chartered under Delaware laws.

Sagua Steamship Corporation, capital \$35,000, of the Atlantic Fruit Company, incorporated at Delaware.

Sydney S. Brees, of Port Jefferson, to do business in boats and ships, has been incorporated for \$50,000.

The Moore & McCormack Company, of Manhattan, has increased its capitalization from \$5,000 to \$500,000.

Tanamo Steamship Corporation, capital \$35,000, of the Atlantic Fruit Company, incorporated at Delaware.

The United Steamship Corporation, of Wilmington, Del., capital \$250,000, chartered under Delaware laws.

Connelly Transportation Company, of Buffalo, capital \$350,000, chartered at Albany, to engage in navigation.

The Quincy Steamship Company, of Manhattan, capital \$100,000, chartered at Albany. H. Goldman, of 120 Broadway, attorney.

The Nautilus Steamship Corporation, of Manhattan, capital \$700,000. Incorporators are: F. V. Barnes, R. F. Wees and J. F. Fessenden.

Shamrock Towing Company, of Manhattan, capital \$10,000, incorporated at Albany. Incorporators: D. J. Dugan, H. H. Lavender and J. J. McGuirl.

The Caddell Dry Dock Repair Company, of Richmond, Va., capital \$250,000, incorporated at Albany, N. Y. Incorporators are: J. B., L. W. and A. Caddell.

The Brighton Dry Dock Company, of West New Brighton, S. I., capital \$250,000, chartered at Albany. Incorporators: J. O. Connor, M. E. Saunders and A. W. Osborn.

The Safety Steamship Company, of Bridgeport, capital \$100,000, to do transportation business. Incorporators are: Arthur Wilkes, Lawrence R. Ahern and David F. Blume.

Commercial Scout Steamship Corporation, capital \$100,000, chartered at Dover, Del. Incorporators are: Linn P. Reed, James H. Tully, and Wallace Ingraham of New York.

American Indian Steamship Corporation, capital \$2,000,000, chartered under Delaware laws, headquarters to be at Tulsa, Oklahoma. The board of directors of the corporation will include bankers, oil men and ranch owners of Oklahoma, all members of American Indian tribes.

FOREIGN ACTIVITIES

Two New Vessels, England.—Messrs. Sir Robert Ropner and Company, West Hartlepool, have placed orders with the Ropner Shipbuilding Company, Stockton, for two cargo boats of 8,500 and 7,700 tons, respectively.

Harbor Developments, Tolago Bay, New Zealand.—The Harbor Board of Tolago Bay, New Zealand, is considering the construction of a wharf and other facilities with sheds and a wool warehouse, estimated cost of the work being £70,000.

Harbor Improvements, Spain.—According to a report received by the Department of Commerce from Ambassador Woods, harbor construction and improvements in Spain are to be undertaken through an appropriation of 18,500,000 pesetas made by the Ministry of Public Works as a Government financial guarantee for loans to be secured by public subscription or otherwise.

Steamer Launched, England.—The twin-screw steamer Murital, built for the Eastbourne Borough Council, Wellington, New Zealand, for passenger service in Wellington Harbor, has been launched by the Coaster Construction Company, Montrose. The vessel is 172 feet 6 inches length overall, 30 feet beam, 12 feet 3 inches deep, and has a speed of 13 knots. Her carrying capacity is from 1,400 to 1,500.

Vessel Launched, Shanghai, China.—The Tze Sui, a vessel designed specially for service on the Upper Yangtze, was launched from the Shanghai yard of the Societe Franco-Chinoise de Constructions Metaliques et Mechaniques, for Chinese owners. She is a twin-screw steamer, 140 feet long, has a loaded draft of 4 feet 6 inches and is provided with ample cargo space, as well as accommodation for a large number of passengers of three classes. She is equipped with two sets of triple expansion engines and has a contract speed of 14 knots.

Finnish Shipbuilding in 1922.—New constructional work at the Finnish shipbuilding yards experienced a further decline in 1922, according to the information collected by the statistical department of the Finnish State Shipping Administration. Vessels under construction amounted to 232 representing a total of 14,099 gross register tons, most of which were lighters. These figures compare with 289 vessels and 25,199 tons in 1921 and 159 and 31,935 tons, respectively, in 1920. Two of the ships under construction in 1922—one steamer and one sailing vessel—were not completed by the end of the year. The total included 20 steamers, 24 motorships and 11 sailing vessels.

STEAMSHIP INTERESTS

The Norfolk, Baltimore, Carolina Line, Inc., will inaugurate, this month, a service to points in eastern North Carolina from Norfolk and Baltimore. One boat will be operated on one round trip a week (starting Tuesday and returning Thursday) between Norfolk and New Bern. A smaller vessel, to be used as a feeder, will be operated on three trips each week between New Bern and Morehead City and Beaufort.

According to W. B. Keene, Director of Traffic, United States Shipping Board Emergency Fleet Corporation, a telegraphic report has been received from Vancouver, B. C., to the effect that the Trans-Pacific Conference Lines in a meeting held recently unanimously adopted and signed the new Trans-Pacific Conference agreement. This agreement is along similar lines to that recently adopted in the North Atlantic under which the lines operating from the Atlantic Coast to the Far East are now functioning, which principally provides for the maintenance of certain rates.

The Red Star liner *Belgenland*, now nearing completion at Belfast, will make her first sailing from New York on April 14, operating with the *Lapland* in fortnightly service for first, second and third class traffic between New York, Plymouth, Cherbourg and Antwerp, which with the cabin-class service will maintain weekly sailings from New York, as at present.

The Red Star Line will, starting April 25 with the *Zeeland* from New York, open a cabin-class service between New York and Antwerp, with calls at Plymouth and Cherbourg eastward, and Southampton and Cherbourg westward on each voyage. The *St. Paul* is the other ship to be used. Each ship will carry in the new service one class of cabin passengers, and third class. The first sailing of the *St. Paul* will be from New York, May 9.

The *Orbita* and *Orduna*, of the Royal Mail Steam Packet Company, are to be converted to one cabin ships, and according to announcement, will in the future carry only cabin and third class passengers. As a result of the classification change there will be a pronounced reduction in the fares.

BUSINESS NOTE

Hanna Engineering Works, 1765 Elston avenue, Chicago, manufacturer and distributor of Hanna riveting machines, air hoists, sand sifters, Mumford molding machines and the Milwaukee Spruce Cutter, is now represented in Detroit and surrounding territory by the Charron Engineering Sales Company, 1002 Real Estate Exchange Building, Detroit, Mich.

TRADE PUBLICATIONS

CALENDARS FOR 1923.—An artistic calendar for the year 1923 has been sent out by the Morse Dry Dock and Repair Company, Brooklyn, N. Y. A feature of this calendar which will be greatly appreciated by shipping interests in the port of New York is a tabulation of high tides, the time of high water at Governor's Island for both A. M. and P. M. appearing in each date square for that day. The calendar is also illustrated

with a photograph of the steamship *Resolute* in dry dock and the *Conte Rosso* backing into a dry dock at the Morse plant.

The Federal Shipbuilding Company, Kearny, N. J., has distributed a calendar on each sheet of which the present month is shown in red and the preceding and coming months in black, giving instant inspection of the current three months. The calendar pad includes each month from December, 1922, to January, 1926, and these pads may be renewed indefinitely as the body of the calendar is of enameled sheet metal.

CORROSION.—The subject of pipe corrosion is discussed in Bulletin No. 3-C issued by the National Tube Company, Pittsburgh, Pa. It is agreed by authorities that oxygen holds the dominating position together with the electrochemical theory in causing internal corrosion. An explanation of this action is given in the bulletin together with the details of the mechanism of corrosion in abstracts from papers which have been delivered before various professional societies. Practical means of preventing corrosion are outlined and the results which may be expected from various methods of water treatment and the like.

MOTORS AND GENERATORS.—Bulletins 126 and 127, covering direct current motors and generators and electric arc welding units, have been distributed by the Burke Electric Company, Erie, Pa. Detailed construction features of the motors and generators are described in Bulletin 126 while No. 127 illustrates the various types and capacities of welding equipment produced by the company.

STOP VALVES.—The R. S. V. stop valve and by-pass made by the R. S. V. Corporation, New York, and its functions are described in a catalogue recently sent out by this company. The device is a drier and superheater of steam for marine and other type boilers. It replaces the ordinary throttle valve and can be connected on the same pipe flange. It has no moving parts and acts like a stop valve.

MARINE OIL ENGINES.—British Kromhout marine oil engines, their history, and construction and application are detailed in a bulletin issued by Perman and Company, Ltd., London, E. C. 3, England. The engine is of the 2-cycle type and is built in units from 9 to 500 brake horsepower. Numerous illustrations are given of installations in various types of ships.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson,
U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York.
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City.
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York
President—E. A. Simmons.
Secretary—Robert B. Lea.

The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irrving G. Keller.

Port of New York Authority

11 Broadway, New York.
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—H. H. Raymond.
Vice-President and General Manager—Winthrop I. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morrison,
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

March, 1923

Number 3

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY
Woolworth Building, New York

F. B. WEBSTER, Editor
H. H. BROWN, Managing Editor

L. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

Contributing Editors

Rear Admiral C. W. Dyson, U. S. N.	William T. Donnelly
Commander S. M. Robinson, U. S. N.	H. McL. Harding
William Gatewood	James L. Bates
Captain C. A. McAllister, U.S.C.G. (Retired)	

WE GUARANTEE that of this issue, 4,850 copies were printed; that of these copies 3,880 were mailed to regular paid subscribers, 389 were provided for counter and news company sales, 204 were mailed to advertisers, 81 were mailed to employees and correspondents and 296 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 14,700, an average of 4,900 copies a month.

MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

Requests for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult, and often impossible, to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address, please be sure to send us your old address as well as the new one.

"Let's Go!"

WHETHER or not the subsidy bill is passed at this session of Congress, the fact remains that we own the second largest merchant marine in the world and this fleet, on the average, consists of newer and more up-to-date vessels than those of any other country. We might as well make up our minds that these ships, with the exception of four or five hundred of an inefficient type, are not going to be abandoned or scrapped. If we do not operate them, there are others that will, even if they are compelled to do so under the American flag.

We have witnessed, as explained in another editorial in this issue, how one of the largest shipyards in England has established itself in the repair business in New York harbor. But listen to this reported quotation of Sir William Reardon-Smith in a recent issue of *Fairplay*: "Incidentally, he also stated, that his personal representative in the United States, Mr. W. C. Liley, had taken out citizenship papers with the ultimate view of establishing an American subsidiary of the Reardon-Smith Line and purchasing ships for operation under the United States flag; that he believed that these vessels could be operated as cheaply or nearly as cheaply as our British steamers, and will have an advantage of low initial cost and other considerations." Will it be necessary for us to pass through the humiliation of seeing foreign ship-

owners come over here and show us, under the guise of intended citizenship or some other subterfuge how to run our own ships? "Let's go!"

The Ship Repair Work Situation

IN spite of the fact that dry docking charges in the New York district have been reduced to 5 cents a gross ton or practically what they were in 1914, data recently collected by the United States Salvage Association show that the average price of ship repairs, due to the present wage scale and the price of steel, is still about 100 per cent greater than in pre-war days. While the price of dry docking indicates keen competition in this field there are many reasons for believing that the future of the ship repair industry offers opportunities that should not be overlooked.

Although a considerable number of ship repair yards were established in America during the war boom we have still a much smaller proportion of dry dock accommodations per ton of shipping than Great Britain. In 1913 Great Britain had 210 docks for 20,431,500 tons of shipping or about 93,000 tons per dock. There were in 1919 on the coast of the United States 44 docks against a total of 13,000,000 tons of shipping or 295,000 tons per dock. Figures are not available for docks installed since 1919 but we have still a long way to go before our repair facilities per ton of shipping equal those of England.

No doubt the relatively high cost of repairs in American yards has been the controlling reason why so large a proportion of this work has been done on British and foreign vessels at their home ports. Nevertheless at least one firm of British shipbuilders and repairers has shown its confidence in the belief that much more British and foreign shipping might be satisfactorily repaired in the United States instead of deferring the work until arrival in home ports. We refer to Swan, Hunter and Wigham Richardson, Ltd., who recently became associated with the New York Harbor Dry Dock Company of Staten Island, N. Y.

As to the prospects for home work, there is the definite circumstance that practically every American vessel that has been tied up for lack of trade will certainly need overhauling and repair work before it can be operated again. In connection with this, the most probable shipping development in the near future, as explained in another editorial, will be the conversion of quite a number of steamers to motorships.

Still further, the provision of the recently enacted tariff law requiring American shipowners to pay a 50 percent tax

same powered engines and the same size auxiliaries it will probably make a decided difference in the initial costs.

This is probably what will happen, for the Government vessels suitable for conversion may be divided into three or four classes and the Shipping Board is considering the advisability of appointing an expert committee to standardize the sizes of engines, motors, pumps and other auxiliaries so that prospective purchasers may be furnished with standard specifications that will have the approval of an authoritative body. As may be easily seen, such specifications would have a decided effect on the price of electrically driven auxiliaries.

Another matter that should not be overlooked in deciding between the steamer and the motorship is whether or not the steam installation in the existing vessel is what it should be. Professor Chapman has assumed an economically designed steam installation but it is a known fact that the machinery in many Shipping Board vessels does not fit the characteristics of the ships.

When the Shipping Board completes its investigations, however, there can be no reasonable doubt that the Diesel installations specified will represent excellent practice both as to main and auxiliary power. Thanks, therefore, to the surplus Government-owned tonnage, it will be possible to obtain the best type of motorship cheaper in America than anywhere else in the world, and this, in our opinion, is a good and sufficient reason to believe that important developments along this line will occur in the near future.

Adoption of Uniform State Marine Insurance Laws Recommended

THE Chamber of Commerce of the United States has sent out a circular letter under date of February 10 recommending the adoption by the various states of uniform marine insurance laws based upon the underlying principles of the Model Marine Insurance Act of the District of Columbia. State legislatures should give this recommendation their earliest attention because American marine insurance companies are meeting foreign competition with the greatest difficulty due both to the conflicting laws of the states and to unjust restrictions and handicaps.

Congress realizing the injustices of these conditions passed the model insurance bill hoping that the several states would modify their laws to conform to it. The fundamental ideas of the bill are as follows: To provide greater freedom on the part of American companies to co-operate through syndicates and mergers. To establish the multi-field insurance principle, so that American fire, marine and fire-marine insurance companies may be free to transact all kinds of insurance other than life. To substitute a system of net profits taxation in place of the system of taxing gross premiums. To enlarge reinsurance facilities. To remove the limitations on the financial powers of companies which hamper operations in foreign fields.

It appears self-evident that there is no logical argument against the adoption of a uniform marine insurance law within the nation providing, of course, that a good model to work on is available. And, in this connection, we are glad to be able to say that the Committee on Merchant Marine and Fisheries of the House of Representatives in preparing

the Model Insurance Bill of the District of Columbia made a very thorough and exhaustive investigation of the whole subject having in mind the fact that they were forming a basis for the states to follow.

Missing Our Great Opportunity

THE Department of Commerce reports that the idle tonnage of the world has been reduced by 2,000,000 gross tons during the year 1922. American merchant ships, however, have failed to make any gain, the idle tonnage as of January 1, 1923, being 4,411,000 gross tons as compared with 4,314,000 gross tons on January 1, 1922.

England in the meantime has reduced her idle vessels by 951,000 gross tons and her shipowners have recently placed substantial orders for new ships. This shows that there is not the world surplus of efficient vessels that insidious propaganda would lead us to believe. In fact, of the 8,955,000 tons of idle tonnage remaining, approximately half of which is tied up in our rivers and harbors, the American vessels alone practically represent the ships that are not obsolete and unfit for competition in the world trade.

The answer is that shrewd English shipowners are aware that the price of new construction has reached a minimum and that world trade and conditions in general are getting better. The prompt acceptance of the terms laid down by the American Debt Commission by the British Government and the fact that this settlement will probably be endorsed by the American Congress by the time that this editorial is printed should have a far-reaching effect on business stability both here and abroad.

What are we going to do about it? Are we going to continue to sell the world short, are we to sit quietly by and watch an inflation of domestic business without providing a governor in the shape of increased foreign trade and American ships to carry it in for the surplusage of our products that is bound to accrue? The Shipping Board will sell first class ships as cheap if not cheaper than they can be bought anywhere in the world, a great subsidy in itself. It has paid for the education of a number of operators and made them agents for the cream of the fleet. Every reasonable request for equipment or fittings that would increase the economy has been provided at the country's expense. All that is lacking is a definite constructive policy on the part of the Government.

Now if Congress evades a decision on the shipping bill at this session, the Shipping Board, knowing that no one has any business to operate Government ships unless he intends eventually to become their owner, should definitely establish a policy not to parallel routes covered by privately owned lines and then it should put the same energy that it has expended in trying to secure favorable legislation into forcing the operators of Government tonnage who have been nursed along through the depression to become financially interested in the vessels that they are running.

The fact that the world's idle tonnage is rapidly decreasing is a strong indication that shipping is on the upturn. If we allow ourselves to become discouraged at the procrastination of Congress, we will miss the greatest opportunity this nation has ever had to assume the commercial and moral leadership of the world.

Give American Shipping a Square Deal!

Why Single Out Shipping and Shipbuilding Among All the Industries of the Country to Be Without Protection?

By "Old Scotch"

A FRIEND recently, in discussing outstanding events in his life, described his saddest experience. It appears that he was orphaned at the early age of six, and was taken over by a relative to raise. Arriving at his new home in November, it was not long thereafter that he attended the Christmas Eve festivities at the Sunday school to which he had been affiliated. The Christmas tree was brilliantly lighted, and laden with presents for both young and old. Laughter, song and joy reigned supreme as customary on such occasions.

As the religious ceremonies were completed, the superintendent in a resonant voice called out the names of every scholar and teacher, and, amid applause, some appropriate gift was handed to each. The one exception in this entire audience was this poor little 6-year-old orphan, whose name had been overlooked either purposely or accidentally, it matters not which, so far as his feelings were concerned. Imagine what thoughts were flashing through that poor child's mind as he wandered home that Christmas Eve in the snow. He told me that for years his mind was embittered by the memory of the overwhelming injustice placed upon him that evening.

Are the shipping interests in this country to be placed in the mental attitude of that poor 6-year-old orphan? is the question now up to the Senate of the United States. Are we in years to come to be embittered against our own Government for singling us out among all the industries of this broad land to be the step-child and helpless orphan? Gentlemen of the Senate, the bare facts of the helplessness of the shipping interests in conducting the foreign trade of this country have been placed before you. In spite of many efforts to camouflage the real situation, you cannot, if you believe in a square deal, sidestep the issue.

LIMITED EXPENDITURE WILL RETAIN GREAT SUMS IN THIS COUNTRY

Such wild statements as: "The pending bill is designed to turn over \$750,000,000 to the Shipping Trust" do not go with an enlightened public. You know in your minds that such is not the fact. You have already limited the total expenditures to \$30,000,000 a year for a period of ten years, and you know that there is no such thing as a shipping trust in this country. If you will reverse that statement and say that the defeat of this bill will turn over \$750,000,000 of the money of your constituents to foreign shipping trusts in the next ten years, you will be approaching the truth, except the amount involved will be perhaps three times that sum. You know from your own Congressional investigations that there is a very potent trust in foreign shipping, and you also know from the same investigations that there is nothing even resembling a trust among the shipowners of your own country.

You know that this term "subsidy" which is not even used in the shipping bill, but only used by the critics of the measure, is nothing more nor less than a protective tariff applied to the shipping industry, and that it is the only practicable method of giving protection and encouragement to the merchant marine.

ONLY SUFFICIENT PROTECTION TO COMPETE WITH FOREIGN INTERESTS REQUIRED

Is there any out and out free-trader in your ranks? My impression is that every one in this country believes in a

tariff to protect the industries in which he is interested be they agricultural, mining or manufactured products. The only differences on the subject of the tariff, between the two great political parties, are in the relative protective rates needed to allow different industries to compete with like industries abroad.

The old economic saw of: "Let him who does it cheapest do our work," does not apply in any branch of American industry which has to compete with foreign output. It is un-American and contrary to our policies which have made us the richest nation on earth. Is it possible that you want to single out our merchant marine as the lone "orphan" upon which to apply this anti-American policy of sink or swim according to economic conditions?

All protective policies which we have introduced in this country have paid indirectly in the building up of the general prosperity of the country. Our merchant marine in its present condition will, if this bill is enacted, pay vast dividends in increased trade abroad beneficial to farmer and manufacturer alike, besides keeping millions of dollars at home for the freight and insurance moneys which must otherwise go abroad to our rivals. In addition, do not overlook the fact that it will actually save money to the Treasury, and that *direct* taxes will be reduced rather than increased.

This proposition is as simple as A B C, yet it has not been properly explained to your farmer constituents. The very fact that an annual sum of \$30,000,000 expended as a protective tariff to shipping, making it possible for Americans to operate many of our idle ships, will give us a market for the sale of these ships, which otherwise must swing idly at their moorings and become disintegrated by the ravages of time. The enhancement in value of these otherwise idle ships will put in the Treasury at the lowest calculation not less than two dollars for every dollar invested in the annual reserve tariff paid to the shipowner.

Was there ever a better straight-out business proposition put up to the American taxpayer?

Where is there a farmer or a tradesman in this country who would not immediately embrace an opportunity of this kind in his own business?

SHIPPING BILL MISREPRESENTED

In conversation with several friends who have recently made trips through the farming communities of the said West, I learn that there is an alarming condition among the citizens there on account of their inability to pay the huge taxes placed upon them by the federal, state and local authorities. They have been taught that this so-called "subsidy" bill is another great increase in their federal taxes. Naturally, like instituting economy among your wife's relatives, they immediately clamor for reform in the industry which they think affects them the least. Tell them the unvarnished truth about this shipping situation, let them know that this bill is a saving and not an additional expenditure, and their good common sense will bring their approval to your action in voting for this measure.

Tell the farmers in the South of the statement made by one of their great senatorial leaders, that the lack of American ships in 1914-16, cost them over one billion dollars in cotton alone.

Tell them also of the two authoritative statements issued

by competent authorities within the past week. The first is that the world's shipping business has increased, as evidenced by the fact that there were over 2,000,000 tons less of idle ships in the world on January 1, 1923, than there were on the corresponding date one year ago. The United States was alone in having more idle ships than in the previous year. The second statement is that American exports actually decreased over \$650,000,000 during the year 1922. Couple these statements and use your own logic as to the ultimate result for our American industries.

COST OF SUFFICIENT MERCHANT MARINE LESS THAN PRESENT FIASCO

There has recently been appropriated the sum of \$50,000,000 to pay the losses of Government operation of merchant ships, and to care for the laid-up ships. Compare this to the sum of \$30,000,000 which is proposed to aid a sufficient merchant marine when placed in private hands. Let the farmer constituent consider that difference when he moodily contemplates his ever rising tax bill.

Assistant Secretary Roosevelt, a chip of the old block,

recently stated in a public address, just what his illustrious father has often stated, that our national safety depends upon the maintenance of a sufficient merchant marine just as much as it does upon the fighting ships of the Navy. They are inseparably linked, each dependent upon the other. Can we fight for our national safety with only one leg upon which to stand?

Shorn of all technicalities, the foregoing are statements of the underlying facts in connection with the shipping problem now before the Congress of the United States. Can a tenable argument be given as to why the bill should not be enacted into law? Many misrepresentations have been brought forth but they cannot withstand the logic of bare facts. A rising tendency towards Government ownership and operation is in evidence, but our experience with the railroads in war times should be sufficient to steer us clear of that procedure with shipping.

Weigh these facts and *give us a square deal*, which when conditions are known and matters carefully analyzed is what the American public always demands of its legislators.

Do not treat us like an orphan!

National Merchant Marine Association Holds Fourth Annual Convention on February 7 at Washington

Representatives of Commercial Organizations, Commonwealths and Cities in Convention Assembled Petition Congress for Speedy Action on Shipping Bill

THE fourth annual convention of the National Merchant Marine Association was held in the Rose Room of the Hotel Washington, Washington, D. C., on February 7. Senator Joseph E. Ransdell of Louisiana, president of the association, opened the convention with a stirring address on the tremendous importance of the merchant marine to the American people. He said that it is going to take all the influence of all the business organizations and maritime associations to build up a favorable public opinion in regard to shipping.

"The subsidy bill has the strongest prospects for a speedy passage," Senator Ransdell said, "but, if the bill is enacted into law"—and he believed that it would be—"it will be essential to maintain this association because a clearing house will be necessary to help mold and maintain public opinion. Should the measure fail it will be all the more necessary for the association to conduct an educational program."

NAVY NEEDS THE MERCHANT MARINE

Colonel Theodore Roosevelt declared that civilization is and always has been based on transportation and communication and that the countries that are the highest developed today are those having the best means of communication.

"The outstanding characteristic of the Roman Empire and the primary factor that built it up and held it together was its splendid system of roads and its fleets of galleys."

The Navy, Colonel Roosevelt pointed out, has the prime function of preserving communication by sea. It is also our first line of defense, but the value of a merchant marine from the standpoint of defense has always been recognized. By the limitation of the Navy the importance of the merchant marine is greatly increased, a point brought out by Secretary Hughes at the Disarmament Conference when he said that the importance of the merchant marine is in inverse ratio to naval disarmament.

The merchant marine is a valuable complement to the Navy in furnishing light cruisers and scouts. It maintains in time

of peace vessels that otherwise would have to be kept in idleness at great expense for the purpose of serving as colliers and supply ships in time of war. We are not a military nation and without a merchant marine where are we to draw the men to man our warships in time of war when a rapid expansion of the Navy is imperative?

The ship subsidy bill is also necessary in order to maintain our high standard of living, declared Colonel Roosevelt. A republican form of government depends on a high average of citizenship and we want our sailors to share this standard. The merchant marine needs the Navy in time of peace, the Navy needs the merchant marine in time of war, and both are needed by the country at all times.

SHIPPING BILL FROM FARMER'S STANDPOINT

The farmer's interest in the shipping bill was discussed in a speech prepared by Senator Wesley L. Jones, which was read on account of the senator's absence by Winthrop L. Marvin.

The farmer more than any other one class in the country needs the immediate passage of the shipping bill, was the conclusion of Senator Jones. It was essential, he pointed out, that our farm products find markets abroad and that their profitable export depends upon reasonable rates and prompt service.

"If there are no ships," Senator Jones said, "there is no market for this farm surplus and this very fact reduces the price for the whole surplus. If foreign ships alone are available to take his crops, the farmer must await their pleasure or convenience and he must pay such freight as they see fit to charge."

Senator Jones said special appeals had been made to set the farmer against the Shipping Bill, why, he did not know. One of the favorite assertions was that the merchant marine payments would go only to wealthy shipowners—an unnamed and intangible shipping trust.

The great bulk of the merchant marine fund, or subsidy money, Senator Jones said, would go to men who will buy

or build American ships and run them in competition with already established foreign ships or lines. "It will lead to American transportation instead of foreign transportation for the products of the American farm," he added, "and what American farmer does not think that is a valuable thing to have?"

"Not only does it furnish him transportation at reasonable and stable rates, but it establishes shipyards furnishing employment to labor and a market for his products and the employment of capital and labor in many different ways.

"The high rates which the people had to pay before American ships were built, went largely to alien ships owned or controlled by great trusts over which we had no control. If we had built a merchant marine, our farmers and business men would have been saved hundreds of millions of dollars that went into the coffers of these foreign shipowners and would have been saved hundreds of millions of tax burden. In addition, much of this money would have been spent at home in the development of our interests and the employment of our own labor, thereby adding greatly to the domestic market for the farmer's products."

MERCHANT MARINE NECESSARY FOR FOREIGN TRADE

Colonel Myron W. Robinson, president of the American Manufacturers' Export Association, declared that if we want to place American goods in the markets of the world then it is necessary to have American ships sailing the seven seas. The whole world, he said, admits that foreign trade is vital, our own people admit it whether they be manufacturers, bankers, farmers or merchants.

The least disturbance on foreign shores today, said Colonel Robinson, is at once shown in our daily business. Our foreign business is much smaller than our domestic business, but still—"It is the tail that wags the dog." Those who read the newspapers of today and cannot see beyond our own shores are certainly near-sighted. It is not only the necessity of foreign trade but the effect of this trade upon domestic business that makes it so essential.

Our economic body must stand on the two legs of transportation, inland and ocean, declared Colonel Robinson. One of these legs, the merchant marine, needs help and that help is the so-called ship subsidy bill. As a matter of fact, all other industries have been generously helped and in each case that aid has been no more nor less than a subsidy.

AMERICAN SHIPS RECOMMEND THEMSELVES

Mr. Frank C. Munson, president of the Munson Steamship Lines, spoke of the present service of our passenger vessels. He declared that the combined passenger and freight ships popularly known as the 535's were vessels to be proud of and that they were operated with the highest efficiency, both on the Atlantic and Pacific.

Referring to the subsidy bill, Mr. Munson stated that if that measure fails, our passenger vessels cannot continue to run and also that the freighters running in conjunction with them and their feeder ships will also have to be discontinued. As an illustration of the general lack of faith in Congress supporting American shipping he said that the International Mercantile Marine Company had built a number of ships in British shipyards since the close of the war. Mr. Munson pointed out the present filibuster as evidence of the influence of foreign interests through large amounts of money spent on propaganda.

On the other hand, Mr. Munson believed that the passage of the subsidy bill would make it possible to dispose of a large number of vessels to private owners. He also thought that it would stimulate the conversion of steamers to motorships and, in this connection, he explained that the Shipping Board would appoint a committee of experts to expedite that project and that there would be many who would take advantage of it.

SHIPPING AND SHIPBUILDING A NATIONAL ASSET

"It is not tolerable that we should, either in peace or war, be dependent on any other nation for our international trade conditions," said Robert Haig, vice-president of the Sun Shipbuilding Company, "and to us, now that naval disarmament is likely to reduce our warships almost to the vanishing point, the necessity of a real mercantile marine is vitally important.

"At all times productiveness in any quarter is governed by the transportation to be obtained," said Mr. Haig, "and where transportation is lacking or inadequate, business languishes, the country's assets are impaired and the people suffer through lack of work, food and fuel. Transportation is the life blood of a nation, and a look abroad will demonstrate how keen the other nations of the world are to maintain and develop their marine transportation.

"Shipping, neither here nor elsewhere," said Mr. Haig, "can not continue unless it is supported by well equipped, up-to-date shipyards, and shipyards will not continue to exist and do good useful work unless they can find employment to sustain the staffs necessary. Shipbuilding is a complex art, requiring for its execution educated and specially trained men. If shipbuilding should be allowed to decline, as it did years ago, these men will eventually drift into other channels and the art and practice of shipbuilding, with all the labor research of years, will be lost."

Mr. Haig said it was abundantly proved that shipyards could not be improvised over night and told of the great work done during the war by the private yards in building and repairing and in training personnel. He pointed out that of all our industries, shipping was the one unprotected one. Mr. Haig then asked why such a vital link in the nation's defense should be ignored.

SUBSIDY BILL WILL REDUCE COST OF OPERATION

Not the least interesting of the addresses delivered at this convention was the speech of the Honorable S. G. McLendon, Secretary of State of Georgia. Mr. McLendon quoted President Harding in his message to Congress, November 21, 1922, as informing the country that our fleet of merchant ships had cost three billions of dollars, that these ships were worth only a fraction of that cost, that in operating less than one-third of our Government-owned ships the people were losing \$50,000,000 a year and that, under the bill now pending, this loss would be reduced from \$50,000,000 to \$20,000,000.

Mr. McLendon declared that it was the first duty of the Government to get rid of the public ownership of any business. It was a Democratic congress, he pointed out, that granted the first subsidy of \$400,000 a year to the Collins Line and this aid, he stated, had been sufficient to enable the American line to beat the Cunard Line. The Democrats, he said, were opposed to a ship subsidy now because of inherited prejudices which they should abandon for the good of the country.

COMMERCE OF UNITED STATES A TREASURE HOUSE FOR FOREIGN SHIPS

Commissioner Edward C. Plummer of the United States Shipping Board pointed out that for years propaganda in the interest of foreign ships, which had found such a treasure house in the foreign commerce of the United States, had pursued a devious course among our people with little difficulty. Now he said the people were awakened to the vast national interests which this question of an American merchant marine involves, and to the fact that the commercial independence of this country,—to say nothing of our national security—demands an adequate fleet of merchant ships under the Stars and Stripes.

"This growth of American business in South America, which has given much employment to Americans, is wholly—

mark, I say wholly—due to the fact that since the war we have put American ships into the service between those countries and the United States. There had been ships plying between Brazil and the United States for fifty years, but they were foreign ships, and the foreigners got the business which is now coming to us. That is the statement of Sir John Thornycroft, and surely no opponent of American shipping would think of questioning the word of a titled Englishman!

"Take the case of our services from the Pacific States to the East Coast of South America. Before our vessels were put on that route business there was negligible. We started with freighters and small cargoes. The business sought by the Shipping Board has so developed that already we have supplemented those freighters with combination freight and passenger ships, and the growth of this business, constant and healthy, is of great benefit not only to the people of the United States but to the people of South America whom we serve.

"Adequate water services between two countries are always beneficial to both countries, and what both of our South American lines have accomplished is a benefit to the South American countries served as well as to the United States."

COMMERCIAL AND FINANCIAL SUPREMACY DEPEND ON SHIPPING

"Command of the seas," declared Congressman George W. Edmonds, "meant in the olden times as it does today; commercial and financial supremacy, and as a consequence marked the most powerful nation. How marked in history are the names of Phoenicia, Carthage, Athens, Rome, Venice, Genoa, Portugal, Spain, Holland and England, for a short time the United States, and again by the indifference of ourselves Great Britain, and how all history of the non-maritime nations sinks into oblivion and fable when compared with our own knowledge of those various 'Mistresses of the Seas.'"

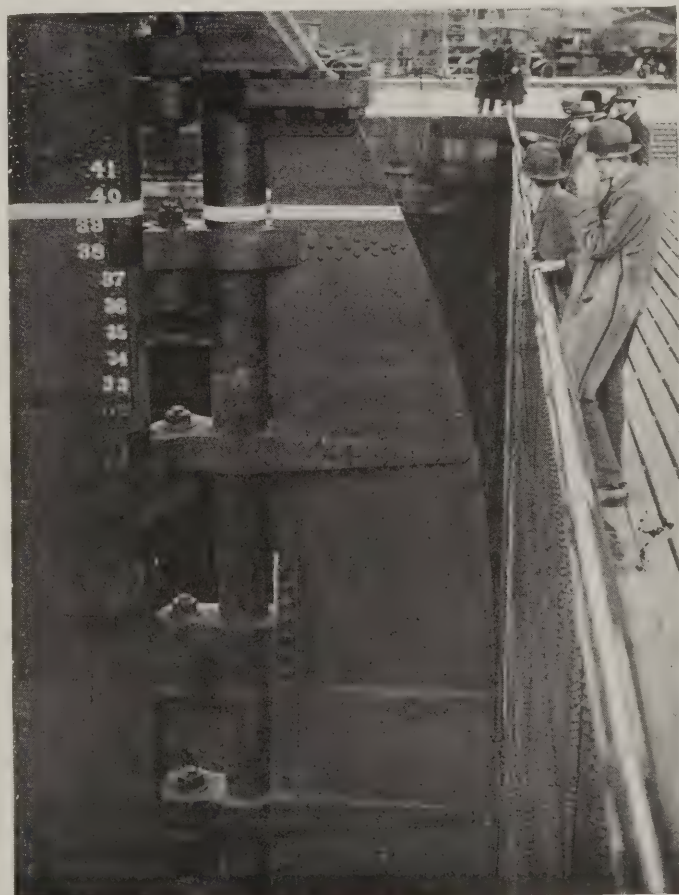
"The merchant ships of all nations were not only a safeguard to the integrity of these nations, but were the pride of their people so much so that almost as far back as history exists it will be found that all governments gave every necessary assistance to forward the interests of their merchant marine.

"As an aftermath of the great war," said Congressman Edmonds, "we again find ourselves in possession of a merchant marine, not well balanced in the types of vessels, but beyond question the second merchant marine in tonnage. We find that to operate these ships, as it is believed American ships should be operated, and on account of the higher cost in the United States compared to other nations, and more than anything else on account of the ship subsidies, ship-building bounties, preferential railroad rates, high postal subventions, and other assistance paid to their merchant marines by our principal competitors, we are forced either to be in the position of letting our ships lie in idleness, and using other ships for our carriage or of giving to our ships such assistance as we find necessary to equalize the differences.

"It appears that owing to unfortunate scandals which have arisen in the past, about certain subsidies which have been given to favored steamship lines, the paying of subsidies by the general Government to shipping has been generally unpopular among people who reside in sections of the country not in touch with shipping, and yet these same people have been assisted by subsidies ever since the beginning of this Government. What was the enormous land grants to railroads but a subsidy, and it was these land grants which opened up the entire Western and Middle West of the United States? What are the Government expenses on rivers but subsidies? Has not the Government spent millions of dollars in destroying the pests and improving conditions on farms, are they not subsidies? Recently we authorized \$300,000,000

for good roads, and nearly one-half of this is already spent or authorized, is not this also a subsidy? And so you could find by investigation that the Government expends vast sums of money, all of which can be classed as aids to special interests.

"The experiences of the past few years," Congressman Edmonds pointed out, "has shown conclusively that our Government as it is situated, is not flexible enough to enter into the business enterprises in which foreign competition is a principal factor. Decisions must be met on a moment's notice and can only be made by a management that is capable and has authority to do so. A Government department or even an executive officer cannot have such flexibility conferred upon them as will be possible in a private corporation. International competition does not lend itself easily to rules and regulations. One thing is particularly fortunate at the present time that we have now several years' experience in the world's shipping business and established certain connections which will assist in the proper conduct of the business. All of this helps and will assist us in retaining a considerable percentage of our tonnage. In the meantime it must be presumed that the continued loss occasioned by the operation of these vessels under Government ownership, together with the depreciation, will continue until the merchant marine of our country dies either from lack of appropriation to continue this loss, or the old age of the vessels will render them obsolete, and we will gradually drift back to allowing our competitors to do our carrying business. Control of the terminal carriage business in our export trade means control of the prices of the commodities exported. Certainly those opposed to the subsidy bill cannot but view with alarm the making of the prices for our own commodities by our foreign competitors in the same."



(Photograph by Kadel & Herbert, N. Y.)

View Showing Rudder of Cunard Liner Berengaria While the Vessel Was in Dry Dock at Southampton

FOAM 2115

UNITED STATES SHIPPING BOARD EMERGENCY FLEET CORPORATION

FUEL DEPARTMENT

SUMMARY OF GENERAL INSTRUCTIONS TO CHIEF ENGINEERS FOR HANDLING BUNKER AND CARGO FUEL OIL AND COAL

I. ORDERING.

A. As much advance notice as possible shall be given by the Master (preferably 48 hours) to the port representative of the Emergency Fleet Corporation or Agent for the vessel.

B. If any trouble exists with burning equipment, tanks, coils, also if any tanks contain any fuel oil not usable, same should be reported at time request for oil is made.

C. Avoid Sundays, holidays, or night deliveries as much as possible.

D. If tugs are necessary to furnish steam, same should be specified when ordering fuel oil.

E. State exact position of vessel and time vessel will be ready to give barge clear berth.

F. State size and type of filling connections.

II. RECEIVING.

A. Bunker tanks should be reasonably free from water, sediment, and other foreign substance and otherwise be in proper condition to receive oil.

B. It shall be the duty of the Chief Engineer, or one of his assistants who is thoroughly familiar with the vessel's fuel-oil system, to be on board at all times when the vessel is receiving fuel and provide the services of sufficient personnel to satisfactorily handle lines and make hose connections.

C. It is imperative to have an understanding with the captain of the barge or deck foreman about signals for "starting," "slowing down," and "stopping."

III. BARGE DELIVERIES.

A. The exact time should be taken when the oil barge comes alongside, when pumping starts, and when pumping has been completed.

B. Ascertain if barge is calibrated and if calibration tables are on board.

C. Before pumping starts, the Chief Engineer or assistant with the barge captain, will gauge and take temperature of the oil. After delivery is complete the engineer and barge captain will again gauge and take temperature of barge tanks and agree on the amount of oil delivered by careful checking of measurements against the calibration tables.

D. If no calibration tables are on barge, the Chief Engineer will note on the delivery tickets the measurements of the barge tanks and the temperature of both opening and closing gauges. Chief Engineer will then sign receipt for one lot of oil delivered and show temperature. He must also note on receipt any delay incident to the delivery and show quantity as shown by measurements of vessel's tanks.

E. In cases where bunkers are taken at the oil docks, the Chief Engineer shall go ashore or send a competent assistant to witness the opening and closing gauges of the shore tanks, take temperature of the oil, and compare gaugings with calibration tables of the shore tanks to determine quantity received.

IV. SAMPLE.

A. When the Emergency Fleet's inspector is not present the Chief Engineer shall see that a fair sample of the oil delivered has been taken. He shall insist that supplier furnish him with at least one pint of the sample, same to be sealed and initialed by the supplier's representative and the Chief Engineer, and be retained by the Chief Engineer at least thirty days. If any trouble is found with the oil, the Chief Engineer is to turn the sample, with seal unbroken, over to the Emergency Fleet Corporation's representative or agent of the vessel at the first port of call for analysis, and make a written report as to the quality and trouble with the oil.

B. Bunker tanks are to be sounded before delivery and after oil has had time to cool. This will give a further check on the amount of oil received. If any great difference in figures, the fact should be promptly reported to the port representatives.

C. For making temperature adjustment in ascertaining net quantities of fuel oil, use the divisional method. Multiply difference in temperature above 60° F. by .0004, add 1 and use result as divisor in dividing the gross barrels; the product will be the net barrels. For example, if 8,000 barrels of oil were received at a temperature of 100° F. the temperature correction would be worked out as follows:

$100 - 60 = 40$ degrees difference in temperature.
 $.0004 \times 40 = 0.016$ plus $1 = 1.016$; $8000 \div 1.016 = 7874.01$ barrels, or actual net quantity of oil received at 60° F.

V. COAL BURNERS.

A. When taking coal bunkers alongside coal piers in the absence of the Emergency Fleet Corporation's inspector, the Chief Engineer shall keep a record of the number of pier cars dumped through the chutes into his vessels and should in every case procure from the pier superintendent a copy of dumping ticket, which ticket should show number of cars dumped and weight of each car.

B. When taking coal bunkers from lighters, scows, or barges, the Chief Engineer shall have some one aboard vessel check the quantity of coal received.

C. The Chief Engineer should use the following cubic capacity, which will be used in figuring the amount of coal in bunkers: 42 to 45 cubic feet per ton of 2,240 pounds. Fine coal will usually run 42 cubic feet to the ton, and large lumps will usually equal 45 cubic feet to the ton. It will be necessary for the Chief Engineer to judge the sizes of the coal in order to get a more accurate check of bunkers received.

D. The Chief Engineer shall give careful study of the capacity of his coal bunkers at different levels and to the manner in which the coal is trimmed in order to give him a further check on the quantity he receives.

E. The Chief Engineer should know the quality of coal that has been ordered and be at least partly familiar with its characteristics, and should himself inspect or have a member of his staff inspect the coal as it comes aboard for any unusual amount of bony coal, shale, dirt, or any other foreign substance. If it is found that the coal is not up to the standard quality of the coal he is supposed to receive, he should at once protest to his port representative. If he is compelled to take the coal, he should note poor quality on the delivery ticket and on his log.

GENERAL.

A. Chief Engineers should turn over all fuel oil in vessel's tanks as often as possible—at least every 30 days, especially in double bottom and peak tanks. Fuel oil allowed to age in vessel's tanks generally becomes contaminated.

B. Special attention should be given at all times to the danger of allowing any oil to enter the waters of the harbor.

C. Every precaution should be taken in using water ballast to avoid mixing water with fuel oil.

D. Special effort should also be made to minimize amount of smoke escaping from anchored or docked vessels.

LOADING AND BUNKERING OF OIL.

The Master will be held strictly responsible for the enforcement of the National Fire Protection Association rules for receiving bunker oil, as quoted below:

Before commencing to load oil, all signal bells, gongs, etc., shall be tested to insure working condition.

Hose used for filling or discharging shall be of the flexible metallic type; couplings shall be equipped with sleeves or some other approved device for the purpose of taking up shock and preventing rupture of connections through tension, in the event of a vessel moving during filling operation.

While oil is being received or discharged, no open lights, smoking or electrical apparatus liable to spark shall be permitted within 50 feet of an oil hose, tank, compartment containing a tank, or vents. Storage tanks shall be watched for leaks.

Hatches on tankers shall be kept closed during loading or discharging. Tugs or other steam vessels shall not be allowed alongside when hatches are open.

If practicable galley fires in tankers shall be extinguished; otherwise openings to the galley shall remain tightly closed during loading or discharging.

On tankers there shall be no fire in the donkey boiler, and all drafts and openings shall remain closed and the fire room hatches covered.

Loading or discharging should, as far as possible, be carried on in the daytime. When carried on at night no lights should be permitted on the deck. Lights shall be in clusters and suspended in the rigging at a safe distance from deck and the wires shall not drag across the deck.

The Chief Engineers shall give close attention to any special instructions issued by the Emergency Fleet Corporation that may affect bunkering at certain ports.

Approved by:

Captain C. A. McALLISTER, Chairman
 Captain R. D. GATEWOOD, (CC) U. S. N.
 Major GEORGE M. TALBOT
 Mr. E. H. PEABODY
 Mr. MAURICE HEALEY
 Mr. F. B. WEBSTER
 Colonel GEORGE BARTLETT
 Mr. D. M. MYERS

Fuel Conservation Committee

JOSEPH E. SHEEDY,

Vice President, Emergency Fleet Corporation

Comparison of Steamships and Converted Motorships

By Lawrence B. Chapman*

The following comparison has been made in view of the keen present day interest in the possibilities of converting idle Shipping Board vessels to motorships. There are a large number of these idle ships that will probably be thrown on the market in the near future at relatively low figures. Some of these ships will be converted to motorships while others will be refitted and repaired to operate with the existing steam machinery.

IN order that the ships that are converted to motorships should be able to compete with the steamers, the ships for conversion should sell at a somewhat lower price per ton. Shipowners hesitate to adopt Diesel machinery because of the larger capital charges of the motorship compared to those of the steamship; and, unless they can see a possibility for a gain over the steamship, many will hesitate to buy these ships and convert them to motorships.

The following comparison has been worked up to throw some light on the comparative performances of the motorship and steamship with different initial costs and on different trade routes. A hypothetical ship of 10,000 tons deadweight has been used and various prices per deadweight ton have been used as outlined below. The comparison is based on annual operating expenses and profits on given trade routes, which is the only way any true comparison can be made.

Certain general assumptions have been made for the assumed ship and the calculations then carried through in as consistent and unbiased a manner as possible. While almost countless minor modifications and variations can be made in the general assumptions, data and conditions of operation, the comparisons tabulated in Tables II and III indicate in a general way the results to be expected on voyages of 5,000 and 10,000 miles. If actual operating data or costs are available that differ from those used, changes can readily be made in the table for a particular case. The main feature in any comparison of this sort is to account for all operating expenses and allow the proper cargo deadweights and fuel consumptions.

In working up the comparison, the gross deadweights have been modified for each ship according to the weight of the machinery installed. This of course reacts to the disadvantage of the motorship, especially on short voyages. On the other hand, the net cargo deadweight used in calculating freight rates allows for the weight of the fuel and feed water required for the voyage in question. This is decidedly to the advantage of the motorship and shows up especially in the comparison of tons carried per year on the 10,000 mile voyage (line 15 in Table III). A twin screw installation has been used for the motorship as this allows higher revolutions per minute and consequently a lighter machinery installation, for a given propeller efficiency.

MAIN PARTICULARS OF SHIP

The dimensions and other characteristics of the standard ship chosen for the comparison are given below. It does not represent any existing ship but merely one assumed for the comparison.

Length between perpendiculars.....	420 feet
Beam	58 feet
Depth	35 feet
Draft	26 feet 6 inches
Displacement	14,380 tons
Block coefficient	0.78
Sea speed	10½ knots
Net tonnage (about)	4,700
Weight of hull and equipment.....	4,000 tons

Four types of machinery installations have been used as follows:

- (1) Four cycle Diesel propelling machinery with steam engine room and deck auxiliaries (twin screw).
- (2) Four cycle Diesel propelling machinery with electric engine room and deck auxiliaries (twin screw).
- (3) Geared turbines, watertube boilers with oil fuel (single screw).
- (4) Triple expansion engines, Scotch boilers with oil fuel (single screw).

The geared turbine installation has been purposely assumed as good service practice and the reciprocating engine somewhat worse than might be expected, in order to cover a wider range in the comparison.

ASSUMPTIONS

The following general assumptions have been made:

- (1) Cost of steamship for conversion to motorship = \$10 per deadweight ton "as is."
- (2) Cost of steamship to operate with existing steam machinery = \$25, \$30, \$40 and \$50 per deadweight ton.
- (3) Cost of converting from steam to Diesel machinery:
 - (a) Keeping all steam engine room and deck auxiliaries = \$350,000.
 - (b) Changing all engine room and deck auxiliaries to electrically operated = \$500,000.

The conversion costs are approximately the accepted figures today and agree very closely with figures given by Mr. J. L. Ackerson in his paper before the Society of Naval Architects and Marine Engineers in November, 1922, which appears elsewhere in this issue. The costs per ton for the steamship are for the ship ready for service which will include a charge of between \$5 and \$10 for overhauling and repairing.

- (4) Days lost per year for repairs, overhauling, and docking = 30.

- (5) Fuel carried is 20 percent greater than the calculated required amount for the voyage. The fuel cost that has been allowed is 5 percent greater than the calculated amount.

- (6) Time in port increased 10 percent over the calculated time for handling cargo to allow for tides, holidays and delays.

- (7) Time at sea increased 5 percent over calculated time to allow for bad weather.

- (8) Ships assumed fully loaded to draft marks.

- (9) Life of converted motorship taken as 20 years (5 percent depreciation) and life of steamship after a general overhauling taken as 14⅓ years (7 percent depreciation).

- (10) Insurance on steamship has been taken slightly higher than converted motorship as shown by line 17 in Tables II and III.

- (11) Repairs, maintenance, painting and overhauling of the ship and machinery have been assumed 5 percent of original cost per year for the motorship and 6 percent for the steamship.

- (12) It is assumed that a rate of 30 tons per hour can be maintained in loading and unloading cargo. This is at the rate of one draft per minute with a draft of 1,120 pounds,

*Professor of Naval Architecture, Lehigh University, Bethlehem, Pa.

which can easily be maintained. Allowing 5 hatches in operation for 10 hours per day, 1,500 tons per day are handled. (See article by the writer in the February issue of MARINE ENGINEERING AND SHIPPING AGE.)

(13) The net tonnage has been taken as 4,700 tons for all the ships; the double bottom was considered available for fuel oil and the machinery space in each case is above 13 percent of the gross tonnage.

(14) The make-up feed water carried has been taken as 3 percent of the total steam consumption of the voyage, assuming that an evaporator is used to take care of any excess over 3 percent.

(15) Port fuel for the steamship and motorship with steam auxiliaries is 7 tons per day; and for the motorship with electric auxiliaries, 1 ton per day.

(16) Fuel oil for the steamship has been assumed at \$1.50 a barrel and 8 pounds per gallon (\$10 per ton); Diesel engine oil has been assumed at 4½ cents per gallon (\$1.88 per barrel) and 7.35 pounds per gallon (\$13.65 per ton).

(17) Lubricating oil at 75 cents per gallon has been allowed for as follows, which is the average practice in service: Geared turbine 1 gallon per 10,000 shaft horsepower hours. Reciprocating engine 1 gallon per 4,000 indicated horsepower hours.

Diesel engine 1 gallon per 3,000 shaft horsepower hours.

(18) Fresh water has been calculated at 50 cents per ton.

Table I shows the calculated data, assumed steam pressures, vacua, revolutions of propeller, boiler efficiency and machinery weights. The effective horsepower has been carefully calculated from Robertson's results and the propeller efficiency has been taken from Taylor's ρ^3 charts. The effective horsepower of the motorship was increased 40 horsepower to allow for the resistance of the struts. A hull efficiency of 1.05 was adopted for the single screw steamship and 1.00 for the twin screw motorship.

The calculated shaft horsepower has been increased by 20 percent to allow for the increase of power in service. The

TABLE I

	Motor ship No. 1	Steamship No. 2	Steamship No. 2
1. Type of machinery.....	{ 4 cycle Diesel	Geared turbine	Triple expansion Scotch
2. Type of boilers.....	Water tube	Water tube	Water tube
3. Model E.H.P. at 10½ knots.....	1,260	1,220	1,220
4. Number of screws.....	2	1	1
5. Propeller efficiency.....	0.605	0.550	0.585
6. Propulsive coefficient.....	0.605	0.570	0.615
7. R.P.M.....	115	90	75
8. S.H.P. + 20 percent margin.....	2,500	2,570	2,400
9. I.H.P. + 20 percent margin (mechanical efficiency = 0.90).....			2,670
10. Boiler pressure (gauge).....		250	200
11. Superheat (degrees F.).....		60°	0
12. Vacuum (inches Hg.).....		28	26
13. $H_1 - q_2$ (feed = 200 degrees F.).....		1,075	1,031
14. $H_1 - H_2$		369	307
15. Efficiency ratio in service.....		0.62	0.575
16. Main engine steam consumption (pounds per S.H.P. per hour).....		11.12	
16a. Main engine steam consumption (pounds per I.H.P. per hour).....			14.40
17. Auxiliary steam consumption.....	25 percent	15 percent	
18. Total steam (pounds per S.H.P. per hour).....		13.9	
18a. Total steam (pounds per I.H.P. per hour).....			16.65
19. Total steam per hour (pounds).....		35,800	44,500
20. Boiler efficiency in service.....		70 percent	70 percent
21. Rate of combustion (pound per square foot heating surface).....		0.50	0.50
22. Calculated fuel (per S.H.P. per hour in service).....	0.42	1.19	1.52
22a. Calculated fuel (per I.H.P. per hour in service).....			1.37
23. Calculated fuel per hour in service (pounds).....	1,050	3,060	3,650
24. Weight of machinery (pound per S.H.P.).....	600	330	
24a. Weight of machinery (pound per I.H.P.).....			490
25. Total weight of machinery (tons).....	670	380	585
26. Make up feed water carried (3 percent) 5,000 miles (tons).....		240	300
27. Make-up feed water carried (3 percent) 10,000 miles (tons).....		480	600
28. Stores and provisions (5,000 miles) (tons).....	50	50	50
29. Stores and provisions (10,000 miles) (tons).....	100	100	100
30. Calculated fuel weight for 5,000 miles + 20 percent reserve (tons).....	280	820	975
31. Calculated fuel weight for 10,000 miles + 20 percent reserve (tons).....	560	1,640	1,950

efficiency ratio and boiler efficiency have been assumed to correspond to good service conditions and are naturally lower than trial and test results. The calorific value of the fuel oil for the steamships has been taken as 18,000 British thermal units per pound, which is a conservative value. The data used and results of the calculations for steam and fuel consumption are also given in Table I. Because of the large amount of fuel and make-up feed water carried on the 10,000 mile voyage the steamships will be unable to carry all of this in the double bottom and consequently will lose some cargo space. In fact, the ship would probably re-fuel during the voyage instead of carrying the entire fuel and water weight. The results, however, as worked up with all fuel and water are very valuable for comparative purposes.

The machinery weights include all engineering weights in engine and boiler rooms, shafting and propellers, and generating sets. The water in the boilers, engines and piping is included but make-up feed water is *not* included as a machinery weight.

The results of the comparison are tabulated in Table II for a voyage of 5,000 miles and in Table III for a voyage of 10,000 miles. The calculations for the geared turbine steamship for 5,000 mile voyage are given below to illustrate the procedure in obtaining the results tabulated in Tables I, II and III.

CALCULATIONS FOR STEAMSHIP WITH GEARED TURBINE

$$\text{Steam consumption} = \frac{2,545}{H_1 - H_2 \times \text{efficiency ratio}} = \frac{2,545}{369 \times 0.62}$$

11.12 pounds per S. H. P. hour.

$$\text{Total steam per hour} = 11.12 \times 1.25 \times 2,570 = 35,800 \text{ pounds.}$$

$$(H_1 - q_2) \times \text{steam per hour}$$

$$\text{Fuel per hour} = \frac{\text{B.t.u. per pound oil} \times \text{boiler efficiency}}{1,075 \times 35,800}$$

$$= 3,060 \text{ pounds per hour.}$$

$$\frac{18,000 \times 0.70}{3,060} = 1.19 \text{ pounds per S.H.P. per hour.}$$

$$\text{Weight of fuel carried per trip} = \frac{20.8 \times 24 \times 3,060}{2,240} \times 1.20 =$$

820 tons.

(An allowance of 20 percent reserve has been allowed for weight of fuel carried as indicated above.)

$$\text{Make-up feed water for geared turbine ship} = 20.8 \times 24 \times 35,800 \times 0.03$$

$$= 240 \text{ tons per trip.}$$

$$\text{Make-up feed water reciprocating engine ship} = 20.8 \times 24 \times 44,500 \times 0.03$$

$$= 300 \text{ tons per trip.}$$

$$3. \text{ Gross deadweight} = \text{displacement} - (\text{hull} + \text{machinery weights}) = 14,380 - (4,000 + 380) = 10,000 \text{ tons.}$$

$$4. \text{ Cargo deadweight} = \text{gross deadweight} - (\text{fuel} + \text{water} + \text{stores}) = 10,000 - (820 + 240 + 50) = 8,890 \text{ tons.}$$

$$9. \text{ Days on run} = \frac{5,000}{10.5 \times 24} \times 1.05 = 20.8 \text{ days.}$$

$$10. \text{ Days in port} = \frac{8,890 \times 2}{1,500} \times 1.10 = 13.0 \text{ days.}$$

$$12. \text{ Single trips per year} = \frac{365 - 30}{20.8 + 13} = 9.9 \text{ trips.}$$

$$15. \text{ Tons carried per year} = 8,890 \times 9.9 = 88,000 \text{ tons.}$$

$$21. \text{ Fuel used at sea per trip} = \frac{3,060 \times 20.8 \times 24}{2,240} \times 1.05 = 717 \text{ tons.}$$

$$\text{Fuel used in port per trip } 7 \times 13 = 91 \text{ tons.}$$

$$\text{Total fuel used per single trip } 717 + 91 = 808 \text{ tons.}$$

$$\text{Cost of fuel per year } 808 \times 9.9 \times \$10 = \$80,000.$$

$$22. \text{ Lubricating oil at 1 gallon per 10,000 shaft horsepower hours. } 2,570 \times 20.8 \times 24 \times 9.9$$

$$= 1,270 \text{ gallons per year.}$$

$$\text{Cost of lubricating oil at 75 cents per gallon} = \$950 \text{ per year}$$

TABLE II—ANNUAL OPERATING EXPENSES (BASED ON A CARGO EQUAL TO THE NET DEADWEIGHT CAPACITY) 5,000 MILES

	1	2	3	4	5	6	7	8	9
Type of propelling machinery.....	Diesel Steam Auxiliaries	Diesel Electric Auxiliaries	Geared Turbine	Triple Expansion	Geared Turbine	Triple Expansion	Geared Turbine	Triple Expansion	Geared Turbine
Type of boilers	Auxiliaries		W. T.	Scotch	W. T.	Scotch	W. T.	Scotch	W. T.
Gross deadweight	9,710	9,710	10,000	9,795	10,000	9,795	10,000	9,795	10,000
Cargo deadweight (Item 3—fuel, stores and water).....	9,380	9,380	8,890	8,470	8,890	8,470	8,890	8,470	8,890
Calculated service fuel per S.H.P. per hour (from table I)...	0.42	0.42	1.19	1.52	1.19	1.52	1.19	1.52	1.19
Days overhauling and lost per year.....	30	30	30	30	30	30	30	30	30
Rate of stevedoring (tons per hatch per hour).....	30	30	30	30	30	30	30	30	30
Rate of stevedoring (tons per 10-hour day) 5 hatches.....	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Days on run (calculated time + 5%).....	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8
Days in port (calculated time for handling cargo + 10%)...	13.75	13.75	13.0	12.4	13.0	12.4	13.0	12.4	13.0
Days per single trip.....	34.55	34.55	33.8	33.2	33.8	33.2	33.8	33.2	33.8
Single trips per year.....	9.7	9.7	9.9	10.1	9.9	10.1	9.9	10.1	9.9
Initial cost of ship (including cost of conversion) ready for Service	\$450,000	\$600,000	\$250,000	\$244,000	\$300,000	\$294,000	\$400,000	\$392,000	\$500,000
Present values per gross deadweight ton (dollars).....	\$46.30	\$61.80	\$25.00	\$25.00	\$30.00	\$30.00	\$40.00	\$40.00	\$50.00
Tons carried per year at full deadweight capacity.....	91,000	91,000	88,000	85,500	88,000	85,500	88,000	85,500	88,000
Annual Expenses									
Depreciation (5% on motorship; 7% on steamship).....	\$22,500	\$30,000	\$17,500	\$17,100	\$21,000	\$20,600	\$28,000	\$27,400	\$35,000
Insurance on hull and machinery (5% and 6%).....	22,500	30,000	15,000	14,650	18,000	17,600	24,000	23,500	30,000
Repairs, maintenance and overhauling (5% and 6%).....	22,500	30,000	15,000	14,650	18,000	17,600	24,000	23,500	30,000
Profit on investment (10%).....	45,000	60,000	25,000	24,400	30,000	29,400	40,000	39,200	50,000
Total capital charges	\$112,500	\$150,000	\$72,500	\$70,800	\$87,000	\$85,200	\$116,000	\$113,600	\$145,000
Fuel used at sea and in port.....	\$46,400	\$34,400	\$80,000	\$95,000	\$80,000	\$95,000	\$80,000	\$95,000	\$80,000
Lubricating oil and make-up feed water.....	3,040	3,040	2,140	4,035	2,140	4,035	2,140	4,035	2,140
Wages of crew	37,500	37,500	37,500	37,500	37,500	37,500	37,500	37,500	37,500
Subsistence of crew (70 cents per man per day).....	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500
Tonnage dues and port charges.....	32,250	32,250	32,300	32,350	32,300	32,350	32,300	32,350	32,300
Brokerage and management at 50 cents per ton carried.....	45,500	45,500	44,000	44,750	44,000	44,750	44,000	44,750	44,000
Stevedoring of cargo at 70 cents per ton.....	127,500	127,500	123,000	119,500	123,000	119,500	123,000	119,500	123,000
Annual operating expenses (sum of 20 to 27).....	\$413,000	\$439,000	\$400,000	\$412,000	\$415,000	\$427,000	\$444,000	\$455,000	\$473,000
Rate per ton of cargo to give 10% return on investment....	\$4.54	\$4.82	\$4.54	\$4.82	\$4.71	\$5.00	\$5.05	\$5.32	\$5.38

TABLE III—ANNUAL OPERATING EXPENSES (BASED ON A CARGO EQUAL TO THE NET DEADWEIGHT CAPACITY) 10,000 MILES

	10	11	12	13	14	15
Type of propelling machinery.....	Diesel	Diesel	Geared	Geared	Geared	{ Triple Expansion
Type of boilers.....	Steam Auxiliaries	Electric Auxiliaries	W. T.	W. T.	W. T.	Scotch
Gross deadweight	9,710	9,710	10,000	10,000	10,000	9,795
Cargo deadweight (Item 3—fuel, stores and water).....	9,050	9,050	7,780	7,780	7,780	7,145
Fuel in service per S.H.P. per hour (from table I).....	0.42	0.42	1.19	1.19	1.19	1.52
Days overhauling and lost per year.....	30	30	30	30	30	30
Rate of stevedoring (tons per hatch per hour).....	30	30	30	30	30	30
Rate of stevedoring (tons per 10-hour day; 5 hatches).....	1,500	1,500	1,500	1,500	1,500	1,500
Days on run (calculated time + 5%).....	41.6	41.6	41.6	41.6	41.6	41.5
Days in port (calculated time + 10%).....	13.25	13.25	11.4	11.4	11.4	10.45
Days per single trip.....	54.85	54.85	53.0	53.0	53.0	52.05
Single trips per year.....	6.10	6.10	6.32	6.32	6.32	6.43
Initial cost of ship, ready for service (including cost of conversion).....	\$450,000	\$600,000	\$250,000	\$300,000	\$400,000	\$294,000
Present value per gross deadweight ton.....	\$46.30	\$61.80	\$25.00	\$30.00	\$40.00	\$30.00
Tons carried per year.....	55,200	55,200	49,200	49,200	49,200	46,000
Annual Expenses						
Depreciation (5% on motorship; 7% on steamship).....	\$22,500	\$30,000	\$17,500	\$21,000	\$28,000	\$20,600
Insurance (5% and 6%).....	22,500	30,000	15,000	18,000	24,000	17,600
Repairs, maintenance and overhauling (5% and 6%).....	22,500	30,000	15,000	18,000	24,000	17,600
Profit on investment (10%).....	45,000	60,000	25,000	30,000	40,000	29,400
Total capital charges	\$112,500	\$150,000	\$72,500	\$87,000	\$116,000	\$85,200
Fuel used at sea and in port.....	\$52,700	\$41,800	\$95,600	\$95,600	\$95,600	\$115,000
Lubricating oil and make-up feed water.....	6,080	6,080	4,280	4,280	4,280	8,070
Wages of crew	37,500	37,500	37,500	37,500	37,500	37,500
Subsistence of crew	8,500	8,500	8,500	8,500	8,500	8,500
Tonnage, dues and port charges.....	20,000	20,000	19,700	19,700	19,700	19,300
Brokerage and management at 50 cents per ton.....	27,600	27,600	24,600	24,600	24,600	23,000
Stevedoring of cargo at 70 cents per ton.....	77,200	77,200	69,000	69,000	69,000	64,400
Annual operating expenses (sum of 20 to 27).....	\$342,000	\$369,000	\$332,000	\$346,000	\$375,000	\$361,000
Rate per ton cargo to give 10% return on investment.....	\$6.19	\$6.70	\$6.72	\$7.04	\$7.62	\$7.85

Cost of make-up feed water at 50 cents per ton (geared turbine ship)=240 × 9.9 × \$0.50 = \$1,190 per year.

22a. Lubricating oil for reciprocating engine ship.
1 gallon per 4,000 I.H.P. hours.
 $\frac{2,670 \times 20.8 \times 24 \times 10.1}{4,000} \times \$0.75 = \$2,520$ per year.

Cost of make-up feed water at 50 cents per ton =
 $300 \times 10.1 \times 0.50 = \$1,515$.

25. Port charges:

Pilotage (inward and outward).....	\$300
Towage (inward and outward)	200
Miscellaneous fees	100
Cooperage and dunnage	300
Clerks, watchmen, etc.	200
	\$1,100

• Dockage at 2 cents per ton per day = $4700 \times 13 \times 9.9 \times \$0.02$ = \$12,100

Tonnage dues (6 cents and 34 cents) = $4700 \times \$0.20 \times 99$ = 9,300

Miscellaneous fees listed above = 1100×9.9 = 10,900

Total port charges per year..... = \$32,300

27. Stevedoring of cargo = $88,000 \times 2 \times 0.70 = \$123,000$.

CALCULATIONS FOR MOTORSHIP (Electric Auxiliaries and Winches)

10. Days in port $\frac{9,380 \times 2}{1,500} \times 1.10 = 13.75$ days.

21. Fuel used at sea per trip = $\frac{1,050 \times 20.8 \times 24}{2,240} \times 1.05 = 246$ tons.

Fuel used in port $1 \times 13.75 = 13.75$ tons.
Total fuel per single trip = 260 tons.
Cost of fuel per year = $260 \times 9.7 \times \$13.65 = \$34,400$.

22. Lubricating oil at 1 gallon per 3,000 shaft horsepower hours
 $\frac{2,500 \times 20.8 \times 24 \times 9.7}{3,000} = 4,040$ gallons per year.

Cost of lubricating oil at 75 cents per gallon = \$3,040 per year.

21a. Fuel used by motorship with steam auxiliaries and winches and donkey boiler.
Additional fuel used at sea by steam auxiliaries (allowing 2 tons per day increase over electric auxiliaries) =
 $2 \times 20.8 \times \$10 \times 9.7 = \$4,000$ a year.
Increase in port fuel with steam winches
 $13.75 \times 6 \times \$10 \times 9.7 = \$8,000$.
Total fuel cost per year = $\$34,400 + \$12,000 = \$46,400$.

24. The wages of the crew are given below. The monthly wages for all the ships are kept the same. The motorships will have the same crew as the steamships with the exception of the firemen. There will, however, be electricians or additional motormen carried on a twin screw motorship and the wages of these additional men will practically balance the firemen of the steamships.

CREW'S MONTHLY WAGES (U. S. S. B. Scale, effective April, 1922).

Master	\$300	Second Assistant	\$145
First Officer	165	Third Assistant	130
Second Officer	145	Deck Engineer	70
Third Officer	130	Oilers (3)	195
Carpenter	65	3 Firemen or 2 Elec-	
Able Seaman (7) at \$55	385	tricians	172.50
Ordinary Seaman (3)		Wipers (3) at \$50....	150
at \$40	120		
Radio Operators (2)		(14)	\$1,267.50
at \$90	180	Steward	\$105
Deck Department (17) \$1,490		Cook	90
Chief Engineer	\$240	Second Cook	70
First Assistant	165	Mess boys (3)	105
			\$370

Total per year....=\$37,500

CONCLUSIONS

In order to make a definite comparison of the several ships, an item of profit (line 19) equal to 10 percent of the initial cost has been added as one of the capital charges. It is true that profit is not generally considered as one of the capital charges; yet it gives a convenient method for the analysis and allows the comparison to be based on freight rates per ton carried (line 29).

The results of the comparison for the 5,000 mile voyage, shown in the last line of Table II, indicate the following:

(1) The motorship with the all steam auxiliaries shows a gain of about 6 percent over the motorships with electric engine room and deck auxiliaries. Or for a freight rate of \$4.54 per ton the motorship with steam auxiliaries would pay a profit of 10 percent against 5.7 percent for the motorships with electric auxiliaries.

(2) A motorship with all steam auxiliaries, selling at \$10 a ton before converting, will give the same return on the investment as a geared turbine steamship selling at a price such that it can be put in service at an overall cost of \$25 per ton. The ship fitted with triple expansion engines and Scotch boilers must be worth less than \$25 a ton to operate on an equal basis. (Line 29, Table II, Column 4.)

(2a) A motorship (with all electric auxiliaries) selling at \$10 a ton will operate on the same basis as a geared turbine and watertube boiler ship worth about \$33 a ton. Allowing \$10 per ton for reconditioning the steamship, which is to be run with the original steam machinery, the ship should sell for \$23 per ton to pay the same profit as the motorship. The reciprocating engine ship will be on an equal basis at a service value of \$25 a ton or a selling price of about \$15 a ton.

(3) If the geared turbine ship is to sell "as is" for \$30 a deadweight ton and allowing \$10 a ton for refitting and repairs (total value \$40 a ton), the freight rate will be \$5.05 per ton carried (Column 7). For the motorship with electric auxiliaries to give a 10 percent return with this same freight rate the original cost before conversion would be \$18.50 per deadweight ton.

Present annual expenses (line 29, Table II, Column 7) = \$439,000

Increase capital charges at \$18.50 per ton (185,000

— 100,000) × 25 percent

21,000

New operating expenses

\$460,000

Rate when carrying 91,000 tons per year.....

\$5.05

(4) For the same conditions mentioned in (3) above the reciprocating engine ship should sell for a price such that it can be put in service at a cost of about \$30 per ton. (Column 6, Table II.)

(5) A comparison of lines 29 and 14 in Table II shows in general that for equal profits at the same freight rate, the value per ton deadweight for the geared turbine steamship

should be about half that of the motorship with all steam auxiliaries. The reciprocating engine ship should have a value of about one-third that of the motorship. If the comparison is made with the motorship with electric auxiliaries, the above ratios are about 1 : 2 and 1 : 2½.

As already pointed out this comparison is not intended to indicate that all geared turbine ships are always more economical than reciprocating engine ships. Table I shows clearly that the geared turbine installation is better not only because of the higher initial heat contents, lower vacuum and better efficiency ratio, but also because of the lighter weight of the watertube boilers. The two types of steamships may be considered, if desired, as representing a steamship with good economy and a steamship with poor economy, irrespective of the type of machinery and boilers installed.

While the foregoing analysis indicates that the converted motorship with all steam auxiliaries is superior to the motorship with all electric auxiliaries, it is very doubtful if this difference would be realized under actual working conditions covering a period of years. The repairs and depreciation on the steam auxiliaries would no doubt be higher than for the electric auxiliaries. Further, it may be that the fuel consumption allowed for the steam auxiliaries at sea is too low. By standardizing the sizes and power of the electric auxiliaries and Diesel generating sets the first cost may be appreciably lower than that used in the calculations. The all-electric auxiliary installation is by far the simplest and most satisfactory from an engineering standpoint and certainly deserves a very careful analysis based on more complete data than the writer had access to.

(6) On the 10,000 mile voyage (Table III) the results are in general similar to those for the 5,000 mile voyage except that the advantage of the motorship is even more marked. For instance, columns 11 and 12 (Table III) show practically identical freight rates (line 29) for a 10 percent profit, yet line 14 shows the total cost of the motorship per gross deadweight ton practically 2½ times that of the steamship. On the 5,000 mile voyage the ratio of costs was about 2 to 1 instead of 2½ to 1 shown here.

If the steamship (Column 14, Table III) sells for \$30 per ton + \$10 for the reconditioning (total value \$40 per gross deadweight ton), the ship for conversion to motorship with all electric auxiliaries could sell at \$31.20 and still pay the same profit as the steamship for a given freight rate. In other words, for a 10,000 mile voyage a ship could be purchased at the same price as the steamer to run "as is" and be converted to a motorship with all electric auxiliaries and make the same profit as the steamship!

Annual receipts from cargo at \$7.62 ton = $7.62 \times 55,200 = \$422,000$
Annual operating expenses, column 11, Table III..... = 369,000

Increase possible in capital charges..... = \$53,000

Total capital charges (\$53,000 + 150,000)..... = \$203,000

New value of ship

812,000

Conversion charge

500,000

Original value of ship (\$31.20 per ton).....

\$312,000

The results given in the tables are for a ship of 10,000 tons gross deadweight and a sea speed of 10½ knots but the results will have practically the same relative values for ships of 8,000 to 12,000 tons and speeds of 10 to 11 knots. Speeds much lower than 10 knots are too low for the best results in service and most of the cargo ships built during the war are hardly suitable for speeds greater than 11 knots.

Mr. John Anderson in his paper before the Institution of Naval Architects in 1918 has shown that ships of less than 8,000 tons are not suitable for long voyages, and the writer has shown in his article in the January issue of MARINE ENGINEERING AND SHIPPING AGE that the Diesel engine does not have any advantage over steam for short voyages. Hence it does not appear feasible to convert the smaller 5,000-ton ships built by the Submarine Boat Corporation into

motorships. However, only a comparative study of this size ship on a given trade route with both steam and Diesel machinery can decide the point definitely. A comparison of the data in Tables I, II and III shows that the motorship is more economical on the longer voyages where saving in the weight of fuel and water is a large item.

CUBIC SHIPS AND SHIPS NOT LOADED TO FULL CAPACITY

In studying the results presented in Tables II and III it should be distinctly borne in mind that they are worked up for ships with cargo weights equal to their full net deadweight capacity. A considerable portion of the advantage gained by the motorship is due to the increased deadweight carrying capacity brought about by the reduced weights of fuel and feed water. For cubic ships that carry cargoes occupying more than 50 cubic feet per ton and ships that are not loaded to the draft marks, the motorship cannot claim the advantages of increased deadweight capacity. Further, the space occupied by the machinery in the motorship will be no smaller than that occupied by geared turbines and watertube boilers; hence there is no gain for the motorship in cubic capacity on voyages under about 6,000 miles. On a voyage of 10,000 miles, however, there is a gain for the motorship in cubic space as the steamship cannot stow in the double bottom all the water and fuel oil for so long a voyage.

On the 10,000 mile voyage, if the ships are not loaded to the draft marks, the cargo deadweight for comparative purposes will be the same. Let us assume the cargo carried per voyage is 6,000 tons for each ship. The following table gives the data and results for such a case, assuming for convenience the same shaft horsepower and speed as before and using the ships from columns 11 and 13, Table III.

TABLE IV.—CUBIC SHIP (at about $\frac{2}{3}$ capacity).
10,000 Mile Voyage

	Motorship	Steamship
Days on run + 5 percent.....	41.6	41.6
Days in port + 10 percent.....	8.8	8.8
Days per voyage	50.4	50.4
Voyages per year	6.65	6.65
Initial cost of ship	\$600,000	\$300,000
Present value per gross deadweight ton capacity	\$61.80	\$30
Tons carried per year.....	40,000	40,000
ANNUAL EXPENSES		
Capital charges (Table III).....	\$150,000	\$87,000
Fuel used at sea and in port.....	45,500	100,500
Lubricating oil and fresh water.....	6,200	4,300
Wages of crew	37,500	37,500
Subsistence of crew	8,500	8,500
Portage dues and port charges.....	17,900	17,900
Brokerage and management	20,000	20,000
Maintenance	56,000	56,000
Annual operating expenses	\$341,600	\$331,700
Rate per ton to give 10 percent return on investment	\$8.50	\$8.30

The results in the above comparison are very interesting. The motorship, which with a full load could carry cargo at a rate 5 percent less than the steamship (columns 11 and 13, Table III), must charge a rate $2\frac{1}{2}$ percent higher than the steamship when working as a cubic ship or when not loaded to full capacity as a deadweight ship. (As already pointed out, the steamship will lose some cargo space on this extremely long voyage because all of the fuel and feed water cannot be stowed in the double bottom. This will reduce the above ratios slightly for a cubic ship.) In this comparison in Table IV neither the increased weight of the Diesel machinery nor the reduced weight of fuel and water have any influence except a slight effect on the displacement and shaft horsepower. The reduction in shaft horsepower due to difference in fuel-water weights is about 6 percent, which will reduce the operating expenses by less than 1 percent.

To appreciate the advantage of the motorship on the long

voyage with full cargoes, the cargoes carried per year should be compared (line 15, Tables II and III). On the 5,000 mile voyage the motorship carries 3,000 tons (3.4 percent) more cargo per year than the geared turbine and watertube boiler ship and 5,500 tons (6.4 percent) more than the reciprocating engine ship. On the 10,000 mile voyage (line 15, Table III) the increased carrying capacity of the motorship is 12.2 percent more than the watertube boiler ship and 17.4 percent more than the ship with Scotch boilers.

DIESEL-ELECTRIC DRIVE

If a Diesel electric installation is used, the weight of the installation will be slightly less than that for the ship with reciprocating engine and Scotch boilers, i.e., 470 pounds per shaft horsepower of the propelling motor. The fuel consumption in service will be between 0.46 and 0.50 pound per shaft horsepower of the propelling motor or about 10 percent higher than that of the direct connected Diesel installation. The space occupied by the machinery will be about the same as the direct Diesel installation and perhaps slightly greater. The net result will be about the same cargo deadweight as the motorship with direct connected Diesel engine. The cost of conversion is problematical. Due to the smaller engines and higher revolutions per minute used, the Diesel machinery will be considerably cheaper. If the electrical cost can be kept down, the Diesel-electric drive offers possibilities. However, for the cargo ship many of the excellent advantages of the Diesel-electric drive, such as ease of control, good economy at reduced speeds, etc., offer no special attractions.

TWO CYCLE ENGINES

The comparisons given above are for ships fitted with four cycle engines. If two cycle engines are used, the machinery weights will be reduced and the increase in fuel consumption will not be appreciably greater. Due to the smaller number of cylinders and reduced weight, the first cost of the main engines should be between 10 and 25 percent less than for the four cycle installation. The motorship with two cycle engines theoretically should be superior to the one with four cycle engines but probably more depends, in the present stage of development, on the particular make of engine rather than on the cycle.

The foregoing calculations are not intended to prove the superiority of any of the types discussed. An attempt has merely been made to present the problem that is attracting so much present day attention in as clear and fair a light as possible as a guide to shipowners who contemplate buying some of the war-time ships.

The writer is aware that his assumptions and data are not the same that everyone approaching the problem would use. There are so many possibilities for changing the assumptions and data here and there that no two could agree in all the details. Yet the broad conclusions reached are comparable and any changes can readily be made in the first cost, depreciation, insurance, etc., to investigate any special case.

Exports Drop: Imports Increase

THE quantity of our ocean-borne imports is steadily increasing and that of our out-bound commerce is as steadily falling off, according to a statement just issued by R. T. Merrill, director, Bureau of Research, United States Shipping Board. The Bureau, in making public the results for the calendar year 1922 and in comparing these results with those of 1921, makes the following comment:

The total export commerce of the United States, exclusive of that moved upon the Great Lakes, has in the last year decreased by 5,500,000 tons while the inward-bound business has increased almost 10,000,000 tons. The total commerce therefore of the United States has increased by over 4,000,000 tons.

Punishments of Merchant Seamen

Changes in Penalties for Crimes and Offenses—Existing Laws Which Affect the Discipline and Economy of a Ship

By Wendell Phillips Raine, M.A., LL.B.*

FROM the days of Jonah to the present time much has been written concerning merchant seamen, and everyone is familiar, through history and story, with the hardships and the horrors of the mariner's life and with the harsh punishments that would be meted out to him for the commission of crimes and offenses.

A hundred years of our own history showed surprisingly slight modification in the severity of statutory penalties and in the decisions concerning the masters' right to enforce discipline. The seamen were little better than slaves. The turning point in their emancipation dates from the passage of the White Act, December 21, 1898. Even as late as 1910, however, the Seamen's Union, in a petition to Congress, decried their unjust treatment. And today, although the Seamen's Act (March 4, 1915) went far towards removing the most gross injustices, there are many who believe that the punishments for certain offenses are still extraordinary and unjust.

It is the purpose of this paper to consider the changes in penalties and punishments since the first congressional statutes of 1790; to show to what extent they were little by little modified; and to present the existing law. It will not discuss such crimes as murder, rape and others of personal character but will confine itself to the following offenses—offenses which "affect the discipline and economy of the ship": (1) The destruction of the ship by arson or in any other way; (2) piracy; (3) mutiny; (4) damaging of the ship or its cargo or embezzlement of the cargo; (5) smuggling; (6) assault; (7) disobedience and negligence; (8) drunkenness; (9) desertion; (10) absence without leave; (11) quitting the ship on arrival at port.

The first three are of grave criminal nature, and are, therefore, the least unjust in the severity of their punishments. The next five in order are also felonious in character, though to a lesser degree, and they, too, will seem to necessitate punishment of a more severe nature than the last three offenses, which are questionably offenses at all, and the punishments for which have received the most severe condemnation. The advance made in the treatment of the first eight, although slow enough, is in line with the advance made in criminal law; but the penalties inflicted for desertion and its sister offenses, having no model and being peculiar to merchant seamen, show less change and are more objectionable.

EARLY CAPITAL OFFENSES

For the first three crimes—including arson, destruction of the ship, piracy, and mutiny—our first criminal law, April 30, 1790, provided the death penalty. Attempted piracy and attempted mutiny were punishable with three years' imprisonment and a fine not exceeding a thousand dollars. There was no relief in the severity of these punishments until 1835, when mutiny was removed from the list of capital offenses, and made punishable by 10 years' imprisonment at hard labor and a fine of two thousand dollars, and attempted revolt with imprisonment for five years or a fine of a thousand dollars or both. In fact, it is to be observed that attempted mutiny might receive even more drastic punishment than was provided for in the earlier statute.

There was little or no further change in these punishments until the passage of the Act of March 4, 1909—"an act to codify, revise, and amend the penal laws of the United States." Its most striking characteristic is the abolition of the death penalty for all types of crimes with which this paper deals, and the substitution of imprisonment and fines. A pirate is imprisoned for life, the most drastic penalty for the crimes under discussion. Likewise, arson, or the destruction of the ship by other means, no longer is punishable with death, but with a fine not to exceed five thousand dollars and imprisonment not to exceed 20 years. The punishments for mutiny and attempted mutiny are simply re-enactions of the provisions given above according to the Statute of 1835, the words "at hard labor" being omitted from the act of 1909.

GRAVE OFFENSES AGAINST THE SHIP

Among the next group of offenses—damaging of or embezzlement of the ship's cargo, smuggling, assault, disobedience or negligence, drunkenness, all offenses of a criminal character, both embezzlement and smuggling have been regarded, first by the general maritime law, and then by recent statutes, as among the grave offenses which a mariner can perpetrate against the ship. There has been not the slightest modification in the three statutes which deal with the subject. The Acts* of 1872, 1898, and 1915, all read in the same way, and are in line with the earlier court decisions.

For damaging the ship or its cargo or for the embezzlement of the cargo or any part of it, the seaman shall forfeit from his wages "a sum equal in amount to the loss thereby sustained," and also, at the discretion of the court shall be imprisoned for not more than 12 months. If a seaman is convicted of smuggling, "whereby loss or damage is occasioned to the master or owner, he shall be liable to pay such master or owner for such loss or damage; and the whole or any part of his wages may be retained in satisfaction or on account of such liability; and he shall also be liable to imprisonment for a period of not more than 12 months."

Assault, disobedience or negligence, drunkenness have particular interest because maritime law from its beginning has approved for them the application of corporal punishment by the master. The apparent need for the master to punish one who assaulted him or attempted to assault him early became one of the customs of the seas. The kind of corporal punishment inflicted varied with the seriousness of the offense and the character of the master. Yet the courts were likely to uphold the action of the master on the score of discipline.

Disobedience, without assault, or negligence of a gross kind had also been deemed offenses within the province of the master from the most remote period of maritime law. The master had supreme authority on board his vessel. He could inflict proper correction on his crew, both for past and present offenses; he had to have authority to enforce the discipline of the ship. Corporal punishment was the instrument best suited to accomplish that result. Flogging was usual. The readers of "Two Years Before the Mast" will remember

*Assistant professor of business law, University of Pennsylvania, Philadelphia, Pa.

*Shipping Commissioners' Act; the White Act; the Seamen's Act.

that horrible as flogging seemed to the author, he questioned the expediency of abolishing it. Only a few years after the publication of that book, however, Congress abolished such punishment. No doubt, it savored too much of the kind of thing the Northerner was denouncing in connection with slavery; and so, almost accidentally, and altogether incidentally, corporal punishment received its death blow. The circumstances are, perhaps, not generally known.

CORPORAL PUNISHMENT ABOLISHED

In the first session of the Thirty-first Congress, the advocates of the abolishment of flogging could get little attention. It looked as if the reform would not be accomplished. Finally, its upholders refused to support an admiralty bill arranging for the transportation of mails between various American and foreign ports, unless there were appended the following provisions: "That flogging in the navy and on board vessels of commerce, be, and the same is thereby, abolished from and after the passage of this act." (September 28, 1850.) Almost 50 years passed, however, before flogging and all kinds of corporal punishments were done away with by statute, and before there was, therefore, any provision for the punishment of a master who violated the law.

The earliest statute to deal specifically with these offenses, the Act of 1872, harsh as it will be seen to be in many ways, provided substitutes for corporal punishment. It meted out heavy penalties, choosing imprisonment as its instrument of punishment, but it did afford means for depriving the master of much of the summary justice he had been wont to inflict, and so marked a step in advance.

PENALTY FOR ASSAULT

In the case of assault the legislation of 1872 still stands, the later statutes of 1898 and 1915 re-enacting it word for word. The penalty for assault is still two years' imprisonment.

The Act of 1872 likewise made the first statutory provision for disobedience and neglect under two headings; wilful disobedience; continued wilful disobedience. For the former the seaman was subjected to not more than six months' imprisonment and a forfeiture of not more than four days' pay, the forfeiture of wages being at the discretion of the court. For the latter, the imprisonment was not to exceed six months, but was to involve either a forfeiture of 12 days' pay for every 24 hours of continued disobedience or neglect, or sufficient to defray any expense which had been properly incurred in hiring a substitute.

The Act of 1898 was a reversal and a modification of the earlier statute in that it made forfeiture of wages, for both wilful disobedience and continued wilful disobedience, the real penalty—the forfeiture of four days' pay for the former, and of 12 days' pay, or defraying of expenses, for the latter. Imprisonment was at the discretion of the court, but for only one month in the first instance, and for three in the second.

Whereas the Act of 1872 is important because it lessened the arbitrary power of the master, it was nevertheless harsh in its penalties, especially in its stress upon imprisonment in addition to fines and forfeitures. It is the Act of 1898 which reflected a fairer, a juster legislation. It deprived the master of the right to inflict punishment; but it did allow him to keep the culprit in irons, on bread and water, until a cessation of disobedience, or until the ship arrived in port, with full rations every fifth day. The Seamen's Act reaffirms all these provisions. It is no longer possible, then, for the master to inflict corporal punishment except for mutiny, and then only as a last resort. A seaman may be confined until he reaches port, but his actual punishment rests with the courts.

DRUNKENNESS

Drunkenness, in its results, was always recognized as a serious menace to the discipline of the ship. Other offenses,

already discussed, often were traceable to drunkenness, although the punishment inflicted was for the offense and not the cause. But the Act of 1872 regarded drunkenness as an offense in itself, not fully covered by other provisions, and made it a misdemeanor punishable with 12 months' imprisonment, if a seaman because of his drunkenness committed any act "tending to the immediate loss or destruction of, or serious damage to such vessel, or tending immediately to endanger the life or limb of any person belonging to or on board such vessel." The present Seamen's Act reaffirms this law.

There seems to be no reason for modifying the punishment for an offense that may be so serious in its effects. In general, however, as one reviews the trend of legislation for these first eight offenses one finds the trend towards alleviation and moderation. Capital and corporal punishment have disappeared; terms of imprisonment have in many instances been shortened; fines and forfeitures are the most usual punishments.

GREATEST EVILS REMOVED BY EXISTING LAW

There is not, as far as the writer can learn, any longer any serious quarrel on the part of the seaman regarding the recent laws for the crimes and offenses already discussed. The greatest evils have been removed. The seaman must admit the necessity for punishment of crimes and offenses that are crimes and offenses on land or sea. The existing penalties are not peculiar to the sea service. That they seem more flagrant because the seaman has promised in his contract not to commit them, does not mean, as far as the existing penalties are concerned, that the punishments are in consequence more severe. His contract merely emphasizes to him the necessity of conduct in accord with the discipline and economy of the ship.

While the mariner's contract is fundamentally the same in principle as any land contract, yet it presents some fundamental differences. First, the seaman can be made to complete his contract, whereas the ordinary contract merely permits the injured party to sue the injuring party for any damages he can prove he sustained. The mariner's contract is more like that type of land contract where equity courts will compel specific performance on the part of the delinquent—contracts, for example, for the sale of land or of chattels of a peculiar personal value, unobtainable elsewhere. Secondly, the mariners' contract is the only contract known to the common law in which the employer, by his own act, can directly inflict a punishment on the employed, for neglect of duty and breach of contract. These peculiarities of the mariners' contract, traceable in all their contracts from ancient times to the present day, are, of course, owing to the necessity of having the seaman bound absolutely to the ship for the period of his engagement, and of having him absolutely dependable during such service.

But the sailor regards himself to all intents and purposes a slave. Especially does he feel the shackles of slavery because he cannot desert, or leave the ship, or quit it in port, without being punished for so doing. His contention is that he is merely breaking his contract and that he is liable only to the extent of damages incurred. The master, on the other hand, may regard any one of these three defections as more detrimental to the discipline and economy of the ship than the actual offenses—violation of the moral law—for which he is punished not because he has violated his contract, although he has done that too, but because he has already committed a wrong.

DESERTION

The most serious offense he can commit, from the master's point of view, is desertion. Desertion is defined as the act by which a seaman deserts and abandons a ship or vessel in which he has engaged to perform a voyage, before the

expiration of his time, and without leave. It is more than a mere unauthorized absence from the ship without leave. It carries with it the intent not to return to the ship's service. Although there are circumstances that justify the leaving of the ship—*sickness, unwholesome food, cruel treatment, deviation in the route, unseaworthiness of the craft—in all cases the justification must be clearly shown, †and no slight pretext can be admitted, such as bad food on a certain day, or a possible leak, or the infliction of moderate chastisement because of the disobedience of orders.

The first Congressional Act (July 20, 1790) relating to the last three offenses of seamen—offenses not criminal in character—provided, in accord with the general maritime law, the following punishments for desertion: (1) The forfeiture of all the wages due the seaman, all the goods and chattels left on board ship, and the payment of damages if any such had been incurred by the master in hiring another mariner; or (2) his forcible apprehension by a justice of the peace at the request of the master. In other words, he paid an enormous penalty; or he was arrested and imprisoned until the vessel sailed.

The law remained practically unchanged until the Act of June 7, 1872. This was in no sense a modification of the Act of 1790, but rather an extension of it, and in general harsher in its penalties. It had, as has already been seen, an obsession for imprisonment as a punishment. The deserter was to suffer imprisonment for a period not exceeding three months, and in addition to forfeit his goods and chattels as well as the wages due him. He did not pay damages in addition to the above, but that was his only immunity, and the cost of such immunity was imprisonment. A backward step had been taken; the status of the seaman was worse than ever; and even though this act provided for commissioners that were to protect his interests, he continued to be punished for breaking his contract, and more severely punished at that.

The coastwise vessels received the first relief; in 1895††, seamen engaged in such traffic were exempted from the penalty of imprisonment. And in 1898, in the first act that frankly endeavored to better merchant marine conditions, seamen deserting in a home port did not suffer imprisonment. Finally, in the Act of March 4, 1915, imprisonment was abolished altogether as a penalty for desertion—a noteworthy advance after more than a century of seizures and imprisonment.

At present the deserter forfeits all or any part of the clothes or effects he leaves on board, and all or any part of the wages which he has earned. The greater justice of his present status is evident. He cannot be seized; he cannot be imprisoned. Yet the anomaly still remains that he is penalized for breaking his contract. Instead of paying damages, he forfeits his wages and his belongings, regardless as to whether the loss to the ship is greater or lesser than the amount forfeited. Perhaps, with the increase of available seamen, future legislation will allow him to collect his earned wages and to secure his personal effects, and will make him liable for damages alone. When that happens, desertion will no longer be listed among the offenses of merchant seamen and punished as such.

ABSENCE WITHOUT LEAVE

Second in gravity, to the master assembling his crew, is the failure of the seaman who has signed shipping articles to go aboard the ship, or his absenting himself without leave after he has already gone aboard. For the former, the Act of 1790 provided that the seamen's contract should state, in writing, precisely the day and hour on which he was to go

aboard his vessel, and stipulated that if he were tardy he was to forfeit one day's pay, and that if he failed to go aboard at all, so that the ship proceeded without him, he was to lose the money already advanced him, together with a sum equal to the amount of the money so advanced, this amount to be secured through any court, or before any justice of the peace in the United States having cognizance of such cases. For the latter—absenting himself without leave—he was fined three days' pay for each day he was away, provided he returned by the end of the second day, or within 48 hours, the sum to be deducted from his wages.

The harshness of this act was in no way relieved by the Act of June 7, 1872, any more than were the provisions for desertion. First of all, the two offenses, that of failure to join the ship and absence from the ship without leave, were included in the same provision, and were made punishable with one month's imprisonment. There was no escaping of the imprisonment. At the discretion of the court the seaman might also forfeit two days' pay, and for every 24 hours of absence, a sum not exceeding six days' pay, or an amount that would cover the expenses of hiring a substitute. The spirit of the Act of 1872 is the same whether it relates to desertion or absence from the ship. Severity of penalty to stop desertion and kindred offenses marks its every article. In short, the penalty made profit out of the seaman's breach of contract, and imprisoned him at the same time.

Relief came to the absentee seaman and to the seaman who failed to join his ship in 1898, as it did for the deserter. It distinguished between the offense in a (1) home port or in the domestic trade, and (2) foreign trade in a foreign port. For the first, imprisonment disappeared, and the seaman forfeited two days' pay, or an amount that would cover the expenses of hiring a substitute. If the offense occurred in a foreign port in the foreign trade, he might be imprisoned for a month, or forfeit two days' pay. The Seaman's Act (1915) did away with imprisonment altogether, retaining only the provision for the two days' pay, thus putting the seaman's contract in this respect very nearly in the class with any other type of contract.

When one breaks the terms of one's contract, one is liable to the injured party for whatever the injured party has suffered. Under the Seaman's Act, the remission of two days' pay seems a reasonable amount to regard as payment for damages; and it can very well be regarded as a payment for damages instead of a punishment for a criminal offense. It established a precedent which can be employed in the future in determining the penalties for the other offenses which are merely violations of the contract and not criminal in character.

Desertion and quitting the ship in the home port will have to receive similar treatment. For the last named offense, there was no legislation until the Act of 1872, which provided for the forfeiture of a month's pay, a law which has been reaffirmed and is incorporated in the Seaman's Act.

IMMEDIATE MODIFICATION OF EXISTING LAWS UNLIKELY

It is unlikely that there will be any immediate modification of the existing laws regarding the offenses of merchant seamen. No other country, excepting Australia, has granted so much to the mariner. As one surveys our whole shipping history, he realizes how much has been gained. Capital punishment has been abolished; corporal punishment has been abolished; seizure of a seaman is no longer possible; imprisonment terms have been reduced; and fines and forfeitures are now equitably adjusted to the actual loss incurred. Yet the seamen hope for more. Even admitting the necessity for punishment in the case of wilful disobedience, they regard the confinement in irons on bread and water as a form of punishment tyrannous and exceptional,

(Continued on page 146)

*Fed. Ces. No. 2953 D. C., 1871; No. 13,697 D. C., 1799; No. 4032 D. C., 1830.

†116 Fed. 212 D. C., 1902.

††The Maguire Act.

British Shipbuilding Outlook Much Brighter

Number of Laid-Up Vessels Continues to Decrease, British Idle Tonnage Has Been Reduced 45.7 Percent During Past Year

By W. H. Wendon

THE outlook for British shipbuilding, and that of allied industries, is brighter than at any time since the great slump set in. Shipowners in all quarters of the United Kingdom are taking their courage in their hands and are placing orders which will keep many yards busy for the remainder of the current year. Vessels of all types are included in this accretion of contracts, from the stately liner to the ubiquitous "tramp."

This happier frame of mind on the part of shipowners has come about only after protracted study of the world-wide shipping and trading situation. And in this regard the views of the experts differ widely as to the wisdom of giving out contracts for new tonnage. Indeed, in at least one notable instance, optimism and the placing of orders for new vessels certainly do *not* go hand in hand. Messrs. Furness, Withy and Company are to increase their fleet by four large Diesel-engined vessels, but as against this interesting fact, Sir Frederick Lewis, the chairman of the Furness, Withy Line, and whose experience in the shipping trade covers a vast field, is of the view that the trading outlook at the moment is difficult and uncertain, and that it must continue so until international trade can be encouraged and developed by an absence of political disturbances and some attempt made at stabilization of exchanges.

PIONEERS NEEDED

As has been the case for a long time past, what has been most needed in order to give the shipbuilding industry a fillip has been shipowner "pioneers," and more particularly is this the case in regard to Diesel ships, which, although increasing in numbers and in size, are still to many an unknown quantity. It is a case, speaking generally, of their not having been tried to ascertain if they are wanting. At least one prominent shipping man has been frank enough to admit the absence of this pioneering spirit in regard to Diesels, although at the same time his company has, in conjunction with an allied undertaking, shared a contract for a new boat with reciprocating engines. Sir Laurence Phillips, chairman of the Court Line, an old-established and well-managed cargo boat concern which has distributed 20 percent per annum to its shareholders of late years, is the authority to whom I am referring. He and his co-directors have considered the whole shipping situation, and have come to the decision that they would not be justified at the present moment in contracting for many new boats, but they think things are, by comparison, so much cheaper that they cannot hurt themselves by having a steamer, or at least a share in one.

SHARING THE RISK

So, as I have hinted, they are forming a subsidiary company—the United British Steamship Company, Limited—and have gone in with the Cressington Steamship Company, which is under the same management, and in this new company they have put up the capital between them. They have ordered a steamer which they think, in the long run, will make money; but the nice point arises: Have the directors got in "at the bottom?" This phase is uppermost in the minds of shipowners at the present time. Many feel that by refraining from contracting now, they will ere long be able to secure new tonnage a little—some say a lot—cheaper. At

all events, the Court Line, in their new venture, admit that it is quite possible that they have not got in at the bottom, but at any rate they have shared the risk, and they consider they have not much to lose. It is, perhaps, not a little singular that, while the company is thinking of new tonnage, even though it be on a small scale, the chairman cannot see that we have yet passed the worst; but, as bad times cannot be expected to go on for ever, he is apparently content to think and believe that good times will be restored some time in the future.

Reverting to Diesels, the Court Line directors, in fixing the type of vessel to be contracted for, considered whether they would build a vessel with Diesel engines, but they came to the conclusion that, while there were many advantages in this method of propulsion, they would rather, for the present, look on, until they could be certain from other people's experience that they were absolutely suitable to their type of vessel. In common with many other owners, however, they will watch carefully the development of internal combustion engines for marine purposes.

So much for the views of those who are inclined to pessimism. In far more hopeful frame of mind is Sir William Noble, an ex-president of the Chamber of Shipping of the United Kingdom, and a successful shipowner at that—who manages the well-known Cairn Line of Steamships, Limited. Much value is detracted from Sir William Noble's bright outlook, however, by the fact that, so far as I am able to learn, he is not backing up his opinion to the extent of contracting for new tonnage—at all events, not on a large scale. However, he sees in the present position qualifications which enable us to look to the future with hope, even if the present is enshrouded in gloom, that is, were there nothing to qualify the unequal balance between the amount of world tonnage and the volume of world trade.

INEFFICIENT AND OBSOLETE VESSELS ARE UNEMPLOYABLE AND UNSALABLE

The first of Sir William Noble's "qualifications" is that in the world's merchant fleet today there are many obsolete vessels, more than in ordinary times, owing to the Great War. Of vessels of over 25 years of age there were on a recent date no less than three and a half million tons, while there are probably two million tons more unaccounted for in Lloyd's classification. These vessels are inefficient and uneconomical, and can never expect to trade again. They will have to be scrapped and, in Sir William Noble's view, they should, in the interests of efficiency, be scrapped. My authority then deducts three and a half million tons as representing the tonnage of oil tankers, as these vessels do not come within the orbit of the ordinary freight market, and he asks: "Is it not proper to deduct a certain proportion of the American war-built fleet, which, though not old, is yet regarded as inefficient, and is now unemployable and unsalable?" He takes into consideration, also, the three million tons estimated to be included in this category, "and which the United States Shipping Board may have to wipe off." Finally, Sir William Noble reasons from the foregoing that we have a total of about twelve million tons which may be deducted from the world's excess of fifteen and three-quarter million tons, leaving an actual excess of effective world tons amounting to well under four million tons, and he concludes

that, once shipowners realize that the excess of effective world tonnage is reduced to this figure, they can take heart of grace again. Sir William Noble's deductions should inspire confidence in the minds of his fellow shipowners, many of whom would, however, feel further convinced were he to give a lead in the matter on behalf of his company.

REDUCTION IN LAID-UP TONNAGE

Confirmation of the brighter feeling in United Kingdom shipping circles taken as a whole is forthcoming from the statistics of laid-up British and foreign tonnage at the 36 principal ports of the United Kingdom. The tables, which are compiled by the Chamber of Shipping of the United Kingdom, and are, therefore, reliable, bring the position up to January 1, 1923, and reveal that, as compared with October last, there is a fall of 11.2 percent in the amount of laid-up tonnage, and since January 1, 1922, a decrease of no less than 45.7 percent. The total number of vessels laid up a year ago was 712, of 1,307,593 tons net. On October 1, 1922, there were 456 vessels of 824,624 tons and on January 1 this year 411 vessels of 732,198 tons. That such a vastly increased quantity of merchant shipping should now be finding employment—of, it is to be presumed, a remunerative nature—in comparison with twelve months ago lends weight to the feeling that better times are with us. With better times for shipowning, so must there be more work for shipbuilders—at all events, that is the lesson of the past.

WAGE ADJUSTMENTS HAVE INCREASED DEMAND FOR TONNAGE

Lower wages have been a factor of great importance in contracts which have lately been placed with United Kingdom shipbuilders. As is now a matter of history, the main point of controversy between shipbuilders and their men was as to whether the 26s. 6d. a week war bonus should be abolished. Negotiations with a view to its extinction proceeded for many months, notwithstanding that before the employers decided to withdraw the remaining ten shillings of the 26s. 6d. it was patent to all in the industry that the prevailing high costs of production were bringing the trade to a standstill. With a comparatively amicable wages adjustment, however, the industry was again set going and orders were distributed with refreshing frequency.

The extent of the increased demand for new tonnage is plainly discernible in official statistics recently compiled. Thus, 78 vessels of 231,187 tons gross were commenced in the quarter ending December 31 last, as against only 55,290 tons in the corresponding period of the previous year. A slight reduction took place in the first quarter of 1922, and a still lower level—38,877 tons—was reached in the succeeding quarter. The third quarter of the year, however, showed an increase of about 44,000 tons, while in the final three months the total reached up to within 30,000 tons of the tonnage placed in the water. While this is, of course, by no means "boom" time progress, it is, in all the circumstances, an encouraging feature. Furthermore, a fair proportion of the vessels contracted for since the revival set in would not have been commenced in time to be included in the figures which I have quoted, so that the position is to that extent better than appears on the surface.

TWO SHIPYARDS REOPEN

Two shipbuilding yards, each of which has been closed for many months, are to reopen. One belongs to the North of Ireland Shipbuilding Company, of Londonderry. The other is the River Clyde Shipbuilding Works at Whiteinch, Glasgow, which were owned by the Lloyd Royal Belge, of Antwerp. The Glasgow property has been acquired by the Australasian United Steam Navigation Company, Limited, of which Lord Inchcape, the head of the P. and O. Company, is chairman, and it is expected that the works will be reopened shortly and operated by a well-known firm on

the Clyde. A few years ago the yard turned out quite a large number of vessels for the Belgian steamship company by which it was owned, but, with the increased cost of production and difficulties owing to the Belgian rate of exchange, the yard was compelled to close down. The steamship company, incidentally, has also experienced hard times owing to the depression, and has, in fact, recently disposed of many of its large and newly-built steamers, at, of course, a mere fraction of the boom-time sums paid for them.

Status of Government Merchant Fleet

J. Barstow Smull, president of the United States Shipping Board Emergency Fleet Corporation, has made public the following status of the Government fleet:

ASSIGNMENT OF SHIPPING BOARD TONNAGE TO TRADES FOR THE MONTH ENDING DECEMBER 31, 1922

Trades	Number Vessels	D. W. T.	Percent
U. S. Government—			
Army Service	1	10,013	0.30
Northern Europe—			
United Kingdom and Ireland.....	77	654,197	19.84
Bordeaux-Hamburg Range	93	834,319	25.30
Scandinavian and Baltic.....	12	88,397	2.68
Total	182	1,576,913	47.82
Southern Europe—			
Span. Atl. and Portuguese.....	3	23,214	0.70
Span. Mediterranean	5	40,467	1.23
Fr. Med., W. C. Italy and Adriatic Sea....	13	103,917	3.15
Greece and Black Sea	18	140,967	4.28
Total	39	308,565	9.36
British India	7	65,720	1.99
Australian	12	107,717	3.27
Hawaii	2	25,384	0.77
Orient	50	530,432	16.09
Dutch East Indies.....	5	44,702	1.36
Total	76	773,955	23.48
Africa—			
East Coast, So. Africa.....	6	52,901	1.60
West Coast of Africa.....	5	43,088	1.31
Total	11	95,989	2.91
South America—			
East Coast	33	287,604	8.72
West Coast	7	43,663	1.32
Total	40	331,267	10.04
West Indies and Caribbean.....	13	54,247	1.65
Foreign Service	14	77,283	2.34
Domestic—			
Coastwise	4	16,716	0.51
Intercoastal	6	52,503	1.59
Total	10	69,219	2.10
(A) Total.....	386	3,297,451	100.00
(A) Total does not include:			
Steel vessels tied up.....	874	5,585,166	
Wood vessels tied up.....	6	24,386	
Concrete cargo tied up.....	2	6,078	
Vessels chartered to Independent Companies	10	35,031	
*Tankers	87	784,785	
Under custody of U. S. S. B. as mortgagee	2	16,621	
Awaiting orders of reconditioning.....	1	15,000	
Awaiting assignment	9	69,545	
Awaiting delivery to purchaser.....	1	5,610	
Contract cargo-unfinished (steel).....	1	9,400	
†Grand total.....	1,379	9,846,611	

*Includes 7 concrete tankers of 48,783 D. W. T.

†Does not include 6 Army transports of 38,235 D. W. T., title to which is vested in Board, although physical delivery to Board has not been effected.

Punishments of Merchant Seamen

(Continued from page 144)

though preferable to the corporal punishment for which it was substituted. A still worse form of slavery exists, they contend, as regards the penalties for desertion. Unlike other workmen, they are deprived of wages which they have already earned, not because of any criminal offense but because they have broken their contract.

To be forced by a criminal prosecution to fulfill their contract is the present grievance of the merchant seaman. They will regard themselves as really emancipated only when the three so-called offenses of desertion, absence without leave, and quitting the ship at the home port are deemed no longer offenses, but simply violations of a contract.

Recent Developments in Marine Insurance

**New War Risk Demand—Shipping Board Boats Re-rated—
Scuttlers and Mortgagees—New Syndicate Agreement—Abso-
lute and Constructive Total Losses—Average Settlements**

By "Bordereaux"

ONCE again the voice of the war risk insurer is heard in the land. The dread possibilities of France in the Ruhr, and the delicacy of the Near East situation with the war-loving Turk glooming in his tent, have had their effects upon shipping psychology. There is a renewed market for war risk insurance, and a very respectable volume of it is being written under open policies. Apprehension is felt in America for goods ashore in Germany; and especially by the American underwriter, because much of it has been covered in this market against strikes and civil commotion—and what is more likely than these kinds of disturbances in event of an uprising against the present German Government? London has shared in the war risk revival. She had to first go through her usual pow-wows between the companies and Lloyd's, to hammer out an agreement; after which concerted action prevailed. The Free of Capture and Seizure clause and the Strikes, Riots, and Civil Commotions clause were reinstated in all policies on all interests to or from or in or through Germany (exclusive of the occupied territory), and on all interests in German bottoms for whatever voyage. These risks excluded by the F. C. S. and the S. R. C. C. clauses are held covered subject to forty-eight hours' notice for cancellation at a premium to be arranged. The American rate is practically the same as the British rate, with the exception that our quotations are for "waterborne only," while theirs includes ten days on shore. The Institute of London companies' war rates are as follows: "To or from German ports, on German steamers, bound out, ten shillings; bound homewards, fifteen shillings. On other steamers, bound out, two shillings and sixpence; bound homewards, five shillings. Outward voyages carry a ten days' sailing warranty."

The Scuttler and the Mortgagee

MUCH has been written about the status of the innocent mortgagees in maritime transactions, and the matter appears to be by way of a drastic settlement in England where underwriters have more than once paid the penalty of sympathy with the man who loaned money on a ship that was later sent to the bottom with the connivance of its owner and master. The courts are always dodging the issue, in that they do not come out with a clean-cut decision pronouncing scuttling or casting-away a peril that was not insured against. Unless British underwriters get a clear court ruling on the subject they will very likely draft a clause of inclusion in all policies on mortgaged steamers excluding payment of losses caused by deliberate scuttling or casting away. It is admittedly a hardship to withdraw insurance protection from innocent third parties, such as mortgagees, who frequently be, but still it is felt to be imperative that the principle be established that in no instance whatever shall an underwriter be called upon to pay a loss on a vessel which has been fraudulently cast away with the privity of the owner. Even if the law remains unaltered it is regarded as impolitic to continue to cover innocent mortgagees, as to do so would be to encourage mortgagees to take risks in advancing money to persons of doubtful integrity, since they could be assured of protection in event of fraudulent loss. In two important cases the English Court of Appeals

recently sustained the underwriters' appeals, in instances of this kind, but the ground of scuttling not being a peril insured against was not established. One of these, the *Grigorios* case, was won on the point that the warranty concerning the amount of insurance on disbursements had been broken. The other, the *Joanna* case, went the underwriters' way because the mortgagees were shown to have had no independent interest in the insurance.

Additional Shipping Board Re-ratings

TWO more shipping lines have been recommended to underwriters for improved cargo ratings by the Conference Committee whose report of October 20 last was at the time believed by many to be final. These additions have just been made:

(1) That the Cosmopolitan Shipping Company, operating out of New York to Havre, Dunkirk, Bordeaux and St. Nazaire, in so far as tonnaged by approved United States Shipping Board steamers, be granted the same classification as any of the following competing lines: Roosevelt Steamship Company; Sir W. Reardon Smith & Sons, Ltd.; Lloyd Royal Belge.

(2) That Swayne & Hoyt, Inc., operating out of Pacific ports of the United States to East Coast of South America, via Panama Canal, in so far as tonnaged by approved United States Shipping Board twin screw passenger steamers not over twenty years of age, be granted the same classification as the twin screw passenger steamers not over twenty years of age operated by any of the following competing lines: Nippon Yusen Kaisha; Osaka Shosen Kaisha; Toyo Kisen Kaisha; and that in so far as tonnaged by other approved United States Shipping Board owned steamers it be granted the same classification as similar steamers of the same competing lines.

NOTE: As it is contemplated by the Shipping Board to tonnage this line with passenger steamers, the service should be distinguished from other services tonnaged by cargo steamers only.

Marine Syndicates' New Agreement

THERE went into effect at the beginning of the present year a further amendatory and supplemental agreement between the United States Shipping Board, the Emergency Fleet Corporation and the subscribers to Syndicate A of the American Marine Insurance Syndicates. Under the provisions of the original agreement, entered into on June 28, 1920, the two former parties were required to appropriate the sum of \$1,000,000 as a working fund from which payments might be made to the Board of Managers of Syndicate A subscribers from time to time in installments as the Board might certify to be required, and in addition to make quarterly advances in the amount of \$250,000 each on account of the operating expenses of Syndicate A. The Shipping Board has advanced \$500,000 of this amount, but not the quarterly advances because the Syndicate managers did not need them. By the agreement the unexpended balance of the \$500,000 is to be returned to the Board not later than December 31, 1923. When the United States Salvage Association was organized the agreement was amended, effec-

tive as of July 1, 1920, permitting the subscribers to employ the Salvage Association to perform the services stipulated to be rendered by Syndicate A. In the prevailing depressed condition of shipping and commerce advances in the amounts originally provided for are not now needed for the operation of Syndicate A; hence the new agreement.

Under the new arrangement a balance of \$125,000 of the \$500,000 already paid in is to be retained by Syndicate A subscribers as an operating or "revolving fund." A plan of monthly settlements has been arranged, the subscribers rendering to the Shipping Board or Emergency Fleet Corporation bills, on the last day of each month, for services performed during such month, itemized so as to show the charge made for the account of each vessel. The work so done is understood to be at cost, so that there shall be no profit nor loss to the Syndicate A subscribers or the United States Salvage Association. These bills are to be paid by the Board or Corporation within thirty days from receipt thereof. These service expenses are to be paid out of the revolving fund, which the Board or Corporation bind themselves to repay so as to keep the fund at \$125,000.

Norwegian Mine Clause Canceled

NORWAY discontinued writing war insurance at the beginning of the year, and the Central Union of Norwegian Marine Insurers, as a consequence, declined to include after that date its eventual mine risk clause in ordinary hull policies. With the restrictions created by the Norwegian marine insurance plan of 1907 the liability of the marine underwriter included the consequences of risks caused by mines laid during the great war of 1914-1918. It is now up to the underwriter to prove that the loss eventually is caused by mines not laid during the great war. Unless special agreement is made at the inception of each individual voyage, the underwriter cannot be held for such mine risks, if the vessel journeys to Russian ports in the Black Sea, the White Sea, or seas affected by a new war or new preparations for war. Underwriters admit that mines have always been supposed to become harmless after floating for a year or two, and yet the Germans appear to have built mines that remain as dangerous as ever long after they should, theoretically, have gone dead. Even today, a mine is picked up, or run into with disastrous results, every once in a while. It is a risk worth insuring against.

Absolute and Constructive Total Loss

THE distinction between these two classes of losses would appear to be sufficiently self-evident, and yet confusion sometimes remains in the minds of the assured. Abandonment is a privilege of the assured, not an obligation. If he does not wish to do so, he cannot be compelled to abandon his property. When a vessel has been destroyed by fire or the sea or any other peril insured against there is an absolute total loss. Charred fragments may remain, or the ship's equipment may have survived, but the subject of the insurance has ceased to exist, and the underwriter, on proof of the loss and of the assured's insurable interest, must pay the face of the policy upon the production of that document; thereafter he is entitled to realize what he may out of the ruins. Should a ship sink in water too deep for salvage operations, or should she be captured by a belligerent in time of war and be condemned by a prize court, or where, owing to the loss of the vessel, the surviving cargo becomes short of destination and so located as to make forwarding impossible, then the thing insured, or a part of it may still exist but it is either definitely removed out of the possession of its owner and he is without chance of recovering it, or, while the goods may exist, the commercial adventure has been completely destroyed. If the cause of the loss was cov-

ered by the policy, then the underwriter must pay as for an absolute total loss.

Constructive total loss arises where the destruction of the property or the commercial adventure is not actual but probable. The ship may be fast on the rocks or on shore and her destruction appear highly probable; she may have sunk in fairly shallow water so that there is a possibility but not a certainty of floating her; she may have been captured by a belligerent, but a chance of restoration may remain, either by recapture or because the prize court finds her detention to have been invalid; or goods may have been saved from a wrecked vessel and be lying at a point where the possibility of their being conveyed to destination remains problematical—in all such instances the cases are of potential total loss. The assured then has the option of abandoning to his underwriters, if the cause of loss is covered by the insurance, he may serve such notice and claim as for a constructive total loss. The notice may be verbal or in writing, and must be given at once, or the right to abandon passes.

Mariners' Insurance Law for Japan

THE next session of the Japanese Diet is to have submitted to it by the Japanese Department of Communications a mariners' insurance law. Private companies have, in the past, looked after this interest, and there has been no national legislation on the subject. But this method has been found to be unsatisfactory because lacking in unity; furthermore, there are a number of shipowners over there who make no provision for insurance. With the recent establishment of a Social Board all business affecting laborers' insurance was transferred from the Department to the Board. After consultations between these two bodies the decision was reached to introduce the new measure at the Diet's next session.

Fruit Damage by Delay

THE United States Circuit Court of Appeals, Fourth Circuit, has recently held that where through negligent stranding a ship chartered for carriage of fruit was late in arriving at loading ports, with the result that fruit awaiting shipment deteriorated, but such as was though fit was loaded, the ship can be held liable for the loss through further deterioration on the voyage. See 284 Fed. Rep. 1. In this instance the cargo was bananas. The custom is to cut the fruit forty-eight hours in advance of the arrival of the ship, but because the vessel was delayed four days in arriving a claim for \$23,533.85 was made. The ship was late because she had stranded in consequence of gross negligence on the part of her navigators.

General Average at Destination

ONE of the propositions that is in for a heated debate when the International Chamber of Commerce meets at Rome on March 18-24 is as to whether general average settlements should take place at the port of destination instead of at the port of embarkation. American marine underwriters are a unit in opposing this eleventh-hour proposal. Indeed, they had no idea that such a subject was to come up, until the tentative program of the meeting was distributed. The Board of Underwriters of New York has unanimously disapproved the idea and has appointed a special committee to bring their views to the attention of the American delegates. They feel that as the parties most interested they should have been consulted in advance. Their opposition is based upon the ground that most ports of destination are without competent adjusters and, further, are not likely to have proper established laws and customs as respects general average.



Steamship Haleakala, Built by Sun Shipbuilding Company for Inter-Island Steam Navigation Company, Ltd.

Express Passenger and Freight Steamship Haleakala

Particularly Adapted to Tourist Trade Having Special Facilities for Handling Automobiles and Carrying Riding Horses

DESIGNED for tropical service between Honolulu and Hilo, the express passenger steamship *Haleakala*, recently completed at the Sun Shipbuilding Company, Chester, Pa., under the direction of Captain L. Curtis, for the Inter-Island Steam Navigation Company, Ltd., has many interesting features. The vessel is particularly adapted to the tourist trade. Every stateroom opens directly onto an open deck, assuring plenty of fresh air which is essential for comfort in a tropical climate. As the vessel will operate entirely in the tropics no steam heating system will be fitted but temporary provision for electric heaters in the crew's quarters have been provided. Another feature that will be appreciated by tourists is the 'tween-deck space which is specially designed for carrying automobiles.

The vessel has been built to the highest class of the American Bureau of Shipping. She has a speed of $17\frac{1}{2}$ knots or approximately that of such Atlantic liners as the *George Washington*, *America* and *Caronia*. The hull is subdivided by seven transverse watertight bulkheads all extending to the second deck except the collision bulkhead which extends to the upper deck. She is equipped with eight lifeboats, each having a capacity of fifty persons and surf boats, 11 of which are operated by Steward mechanical davits.

GENERAL DESCRIPTION

The *Haleakala* is a single screw steel steamship of the flush deck type, with raised forecastle. She is built on the transverse framing system and has a straight stem slightly flared forward. Her bows are flared and her stern is elliptical. The double bottom extends the entire length of the vessel and she has two complete hull decks and two superstructure decks.

There are two steel pole masts with wood pole topmasts. Each mast is built in two strakes with lap seams and strapped joints. Two steel cargo booms of 5-ton capacity, having

sufficient length to land loads 12 feet clear of the ship's side with derrick at about 45 degrees, are fitted on the foremast.

THE BOAT DECK

The deck houses on the boat deck are of wood. In the forward deck house on this deck are located the pilot house, wireless room and officers' quarters. On top of the pilot house is the flying bridge, the forward end and wings of which are entirely enclosed and fitted with windows. A standard compass, steering wheel, telegraph and telephones are installed on this bridge.

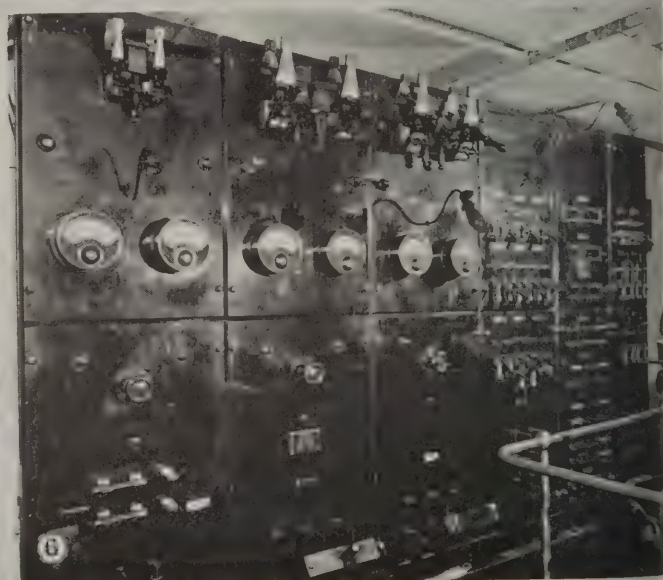
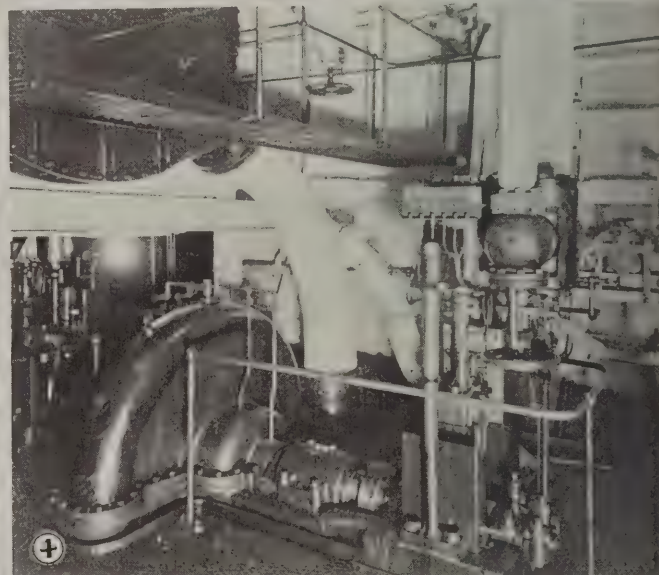
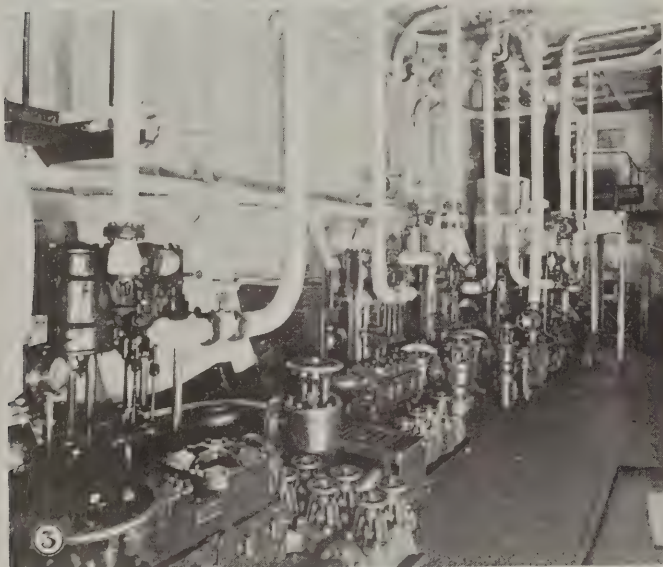
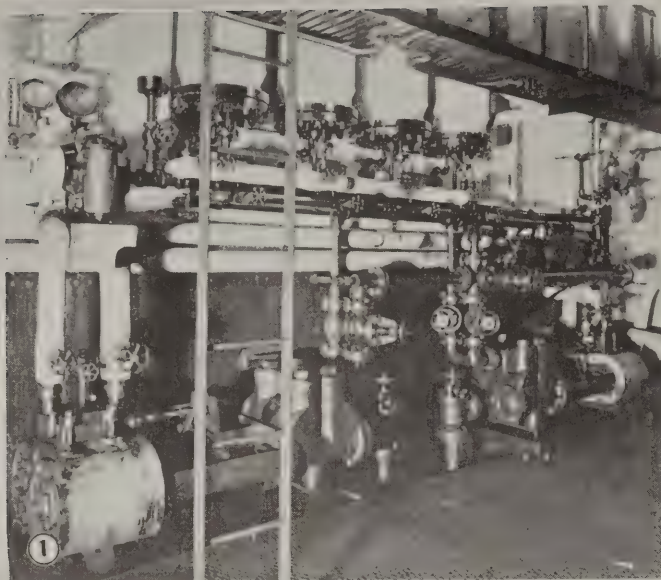
The usual standard navigating instruments and steering apparatus are located in the pilot house but, in addition to this, it will be noted from the plans that a chart table is installed in this room instead of in a separate chart room. The wireless room is made sound proof by hair felt fitted between the outer and inner sheathing. The after deck house is entirely devoted to passenger accommodations.

BRIDGE DECK

The forward portion of this deck or forecastle is arranged for handling the anchors, mooring lines and the cargo. The deck houses are of wood. It will be noticed that all staterooms are outside rooms and that all of their doors open directly on to the deck. These doors, which are particularly wide, all open forward and are fitted with stops and springs to prevent shocks. Windows in all staterooms and officers' quarters are of the balanced drop type with inside slatted blinds. The writing room forward is furnished in Colonial style and the smoking room aft is paneled in oak.

UPPER DECK

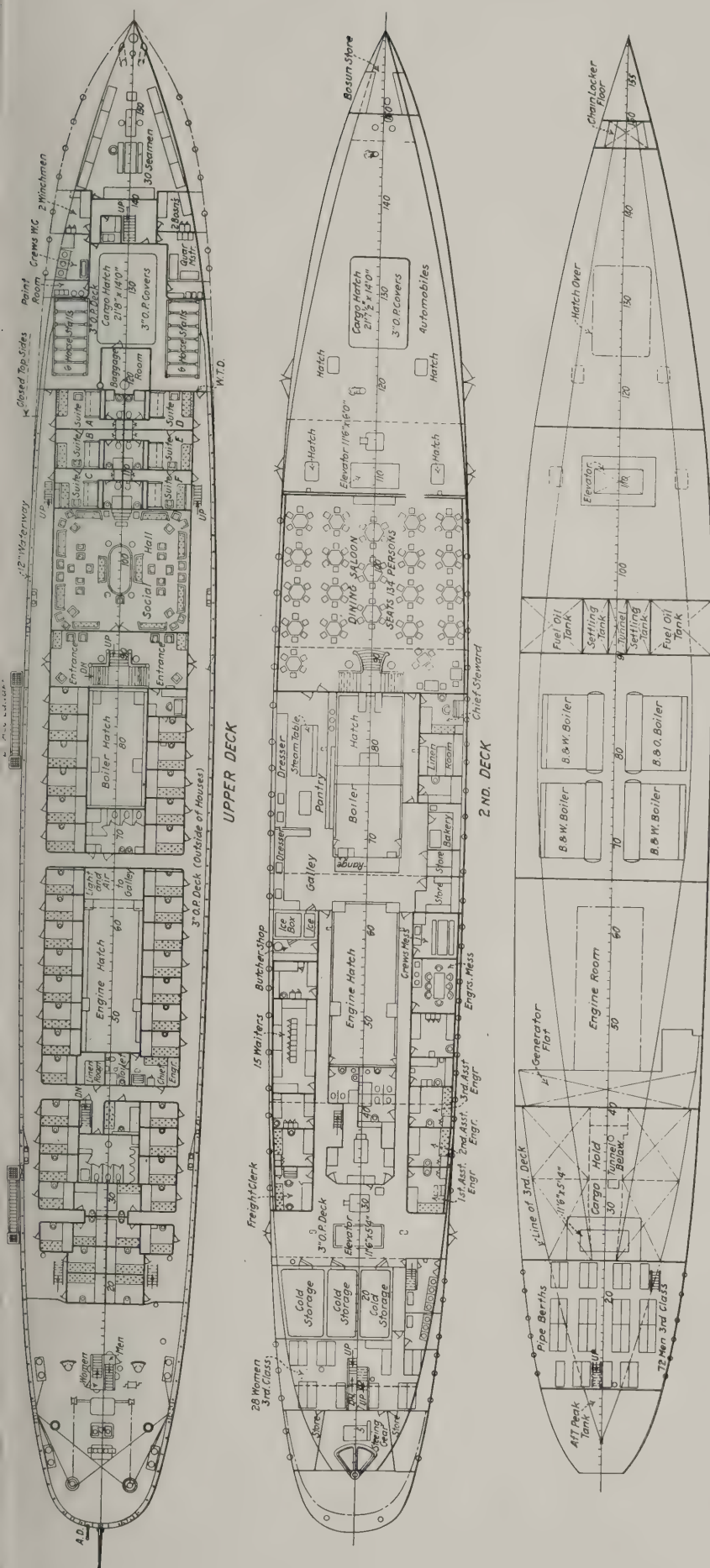
The crew's space is located at the extreme forward end of this deck, thirty seamen being berthed in one room and the



S. S. Haleakala: Interior Views of Engine and Boiler Rooms. (1) Fuel Oil Burning System. (2) Boiler Room. (3) Engine Room Auxiliaries. (4) Circulating Engine and Pumps. (5) Engine Room Auxiliaries. (6) Switch Board.



S. S. Haleakala: Interior Views of First Class Accommodations and Flying Bridge. (1) Writing Room. (2) Flying Bridge. (3) Dining Saloon. (4) Social Hall. (5) Typical Suite Room. (6) Typical Stateroom



Deck Plan of New Express Steamship Haleakala

petty officers in separate staterooms. Between the crew's space and the passenger accommodations and in way of the main cargo hatch, stalls have been fitted for twelve horses. A baggage room has also been constructed just aft of the hatch and extending to a bulkhead which forms the after end of the inclosed portion of this deck.

The passenger accommodations on this deck are inclosed in steel deck houses, the sides of which are located far enough inboard from the bulwarks to provide plenty of promenading space.

SUITES DE LUXE

There are six suites with separate toilets and showers on this deck all decorated in different designs. A Pullman berth is fitted in each suite to accommodate a third person when desired. The remainder of the deck is occupied by first class accommodations, including a large social hall.

THE SECOND DECK

The forward end of this deck will be used for cargo space and for stowing automobiles. Cargo doors are fitted in the sides of the ship through which cars may be driven or merchandise trucked on or off. A feature here is a freight elevator on which several truck loads of cargo may be lowered to the hold at the same time and then wheeled to their stowage location. It will be noted from the plans that the only means of access for the horses on the deck above is through the cargo hatch, which means that they will have to be picked up by slings or driven up a ramp.

The first class dining saloon located just forward of the boiler hatch on this deck will accommodate 134 passengers at one sitting. It is finished in Colonial design and with tables seating six persons.

Aft of the dining room and along both sides of the engine and boiler casings are located the galley, pantry, bakery, linen room, engineer officers' quarters and crew's messroom. The cold storage rooms and steerage accommodations for women are located aft.

VENTILATION

Particular care has been taken to provide ample ventilation. In addition to the natural ventilation through cowls, fans are installed as follows:

A 400-cubic foot suction fan located in a locker on the upper deck drawing from the suite toilets and discharging to the atmosphere through a ventilator on the flying bridge.

Two 1,500-cubic foot fans located in the social hall entrance, taking air directly from the atmosphere and dis-

Express Passenger and Freight Steamship Haleakala

General Information

Service: Passenger and Freight.

Builder: Sun Shipbuilding Company, Chester, Pa.

Owner's Representatives: Pillsbury and Curtis, Naval Architects, San Francisco, Cal.

Owner: Inter-Island Steam Navigation Co., Honolulu, T. H.

Characteristics

Length, overall 360' 6½"
 Length, B. P. 345' 0"
 Breadth, molded 46' 0"
 Depth, molded 32' 0"
 Draft, loaded 20' 0"
 Draft, light 16' 4¾"
 Block coefficient 0.535
 Midship section coefficient 0.862
 Longitudinal coefficient 0.621
 Speed, loaded, knots 16.5
 Cruising radius, nautical miles 6,600
 Framing Transverse
 Class A. B. S.

Tonnages

(In tons of 2,240 pounds)

*Weight of Hull
 **Weight Propelling Machinery
 Deadweight Capacity 1209 T.
 Displacement 4,885 T.
 (In tons of 100 cubic feet)
 Gross register 3,679
 Net register 1,546
 *Weight of Hull includes Hull Proper, Hull Fittings, Equipment and Outfit.
 **Weight of Propelling Machinery includes Engines, Boilers (Wet), Shafting, Propellers, and Machinery Space Auxiliaries.

Canal Ratings

(In tons of 100 cubic feet)

	Gross	Net
Suez		
Panama	4,296	2,158

Equipment

Anchor—2 Bower 5,600 lbs.
 1 Bower 4,760 lbs.
 1 Stream 2,100 lbs.
 1 Kedge 840 lbs.

Chain—170 Fathom 2" stud.

Rudder

Area 105.0 sq. ft.
 Dia. Stock 12"
 C. Press. abaft C. L. pintles 2.95 ft.

Complement

Deck officers 4
 Deck crew 37
 Engineer officers 4
 Engineer crew 12
 Purser's and steward's department 24
 Total officers and crew 81
 First-class passengers 334
 Second-class passengers 100
 Third-class passengers
 Total passengers 434
 Total complement 515

Handling Equipment

	No.	Type	Capacity	Length
Masts	2	Steel		
Derrick posts				
Booms	2	Steel	5 tons	
Discharging Capacity				

Deck Machinery

(Number, Size, Type)

Steering Gear—One 9 x 9 steam
 Windlass—One 9 x 10 steam
 Capstans
 Winches—Four 7 x 10 steam
 One 8¾ x 10 steam

Life Saving Equipment

Lifeboats	No.	Type	Length
	8	Neward	26 ft.
	4	Surf boats	26 ft.

Propelling Machinery

Boilers

Number Four
 Type Watertube
 Length
 Width or Diameter
 Furnaces 24
 Fuel Oil
 Draft Forced
 Total heating surface, square feet 19,200
 Total grate surface or furnace volume
 Superheat, degrees F.
 Working pressure, lbs. per sq. in. 220
 Normal fuel consumption:
 Per day, tons
 Per horsepower hour, pounds
 Normal steam production:
 Per hour per pound of fuel lbs.
 Total per hour lbs.

Engines

Number One
 Type 4-Cyl. Triple
 Size 30 x 52 x 65 x 65 x 54 stroke
 Horsepower 5,000

Propellers

Number One
 Type 4 Blades
 Weight
 Diameter 17' 3"
 Pitch 24' 9"
 R. P. M. 80
 Projected area
 Developed area

Auxiliary Machinery

(Number, Size, Type)

Machinery Space

Condensers One
 Evaporators }
 Distiller } None
 Filters }
 Feed water heater Griscom-Russell
 Fuel oil heaters 4-Coen
 Pumps—16" Circ.
 1—14 x 35 x 21 Air Pump.
 2—15½ x 11½ x 24 Feed Pumps.
 1—12 x 8½ x 12 Fire & Gen. Serv. Pump.

1—10 x 12 x 10 Ballast Pump.
 2—7½ x 7 x 10 Bilge Pumps.
 1—7½ x 7 x 10 Fresh Water Pump.
 1—7½ x 9 x 10 Sanitary Pump.
 2—10 x 4½ x 10 Fuel Oil Serv. Pumps.
 1—7½ x 10¼ x 10 Transfer.
 2—Hand Fire Pump.

Refrigerating Machinery

1—3-ton

Electric Equipment

Generators 2—60 k.w., 1—20 k.w.
 Radio I. K. W. Radio Corp. of America
 Emergency Storage Batteries

Holds

No.	Length	Hatches
1	64	1
2	42	1

Capacities

Cargo Space

Compartment	Cu. Ft.
Hold No. 1	22,351
Hold No. 2	24,084
Tw'n d'k—Fwd.	26,507
Tw'n d'k—Aft.	9,463
Fcsl. tw'n dk.	6,700

Refrigerated Space

Compartment	Cu. Ft.
No. 1	723
No. 2	825
No. 3	935

Bunkers

Compartment	Cu. Ft.	*Bbls.	*Tons
Fwd.	7,884		
Aft	7,159		

Tanks

Compartment	Cu. Ft.	Tons	
		F. W.	S. W.
No. 1—1-B	2,168		62.0
No. 2—1-B	4,107		117.0
No. 3—1-B			98.0
No. 4		208.0	
No. 5		113.0	
No. 6			40.0
Total		321.0	317.0

charging through ducts to each side of the dining saloon.

Two 1,300-cubic foot fans located on the upper deck level in the galley trunk taking air directly from the passageway on the upper deck and discharging through ducts to all rooms between frames 62 and 86 on the second deck.

Two 1,300-cubic foot fans located in the chief engineer's toilet and linen room on the upper deck, taking air direct from the passageway and discharging through ducts to all toilets and quarters between frames 29 and 62 on the second deck.

Two 1,300-cubic foot fans located on the upper deck entrance taking air direct from the atmosphere and discharging through ducts to the third class quarters.

Four 1,000-cubic foot fans will circulate air through a 10-inch air passage or cofferdam fitted around the engine and boiler casings in the way of the quarters. An individual 10-inch electric fan is fitted in each first class stateroom and special fans in the public rooms.

PROPELLING MACHINERY

The propelling machinery consists of one four cylinder triple expansion engine to be supplied with steam at 210 pounds per square inch at the throttle.

BOILERS

The vessel has four Babcock & Wilcox marine watertube boilers, each having 4,809 square feet of heating surface, or a total for the four boilers of 19,236 square feet, arranged for oil fuel. The boilers are thirty sections wide, each section having six and one-half clusters of four 2-inch tubes with one 4-inch tube over the furnace, the tubes being 10 feet

long. The boiler capacity has been so designed that three boilers will at all times maintain power with main engines and auxiliaries working maximum capacity, leaving one boiler for reserve, as required by the owners.

Each boiler is equipped with six Babcock & Wilcox mechanical atomizing oil burners, Cuyama type, arranged to operate under forced draft. Individual blowers situated at the rear of the boilers deliver the necessary air through ducts running under the boilers to the duct surrounding the burners formed by the outer and inner front plates of the boilers.

OIL AND BALLAST SYSTEM

The double bottom compartments, except under the engine and fire rooms and fore-and-aft peak tanks, are fitted for both oil and water ballast. The double bottom compartment under the engine room is for fresh water only and that under the fire room for oil only. The forepeak tank is fitted for water ballast only and the after peak tank for fresh water and ballast.

The oil system manifolds are located in the machinery space and are connected to the fuel oil transfer pump. There is a port manifold and a starboard manifold with separate suction pipes to each compartment and the piping is so arranged that oil can be transferred from a forward port tank to a starboard forward tank or vice versa for trimming purposes.

The ballast system consists of a starboard and a port manifold connected to ballast pump. Separate suction pipes run to each compartment and the piping is so arranged that ballast can be pumped to port or starboard and also to peak tanks.

Express Steamers Ordered for Eastern Steamship Line

Contract for Two Oil Burning, Turbine Driven, 17-Knot Passenger Steamers Awarded to Bethlehem Shipbuilding Corporation, Ltd.

A CONTRACT for the construction of two 17-knot, turbine driven, passenger steamers for night service on the Boston-New York run, operating through the Cape Cod Canal, was awarded last month to the Sparrows Point yard of the Bethlehem Shipbuilding Corporation, Ltd., by the Eastern Steamship Line, of which Calvin Austin, India Wharf, Boston, Mass., is president. The vessels, which were designed by Theodore Ferris, naval architect and marine engineer, 30 Church street, New York, will cost approximately \$3,650,000. The first vessel will be delivered in April and the second in May, 1924.

The principal dimensions of the vessels are as follows:

PRINCIPAL DIMENSIONS

Length over guards	402 feet
Length over hull	401 feet 1 inch
Length on 15-foot waterline	396 feet 4 inches
Length between perpendiculars	385 feet
Beam over guards	72 feet 6 inches
Beam over hull	71 feet 2 inches
Beam at 16-foot 6-inch waterline	56 feet 6 inches
Depth molded to main deck at side	23 feet 9 inches
Designed load draft	16 feet 6 inches

At the 16-foot 6-inch molded draft in sea water the vessels will have a displacement of 5,300 tons. The block coefficient on the displacement length of 395 feet is 0.5035.

Propulsion of the vessels will be by twin screws, driven by geared turbines. With the propellers turning at 120 revolutions per minute the designed shaft horsepower of the propelling machinery will total 6,400; at a 17-knot service speed

on a 16-foot 6-inch draft the estimated effective horsepower is 2,580 and at a 19-knot maximum speed on the same draft the estimated effective horsepower is 3,980.

It is estimated that the shaft horsepower required for a service speed of about 16½ knots will be about 4,500 and the fuel consumption for all purposes 1.2 pounds per shaft horsepower per hour. The fuel requirements will be as follows: 15 hour run, one way, 36 tons of oil; 15 hour run, round trip, 72 tons of oil; port use, 5 tons of oil; total fuel oil, round trip, 77 tons of oil, or about 530 barrels. The total fuel oil capacity in the deep tanks is 270 tons, which is sufficient for about three round trips.

The tonnage of the vessel is approximately: gross, 5,100; net, 2,850.

While the service speed of these steamers as night boats between New York and Boston operating through the Cape Cod Canal will be nominally 17 knots, because of delays and detentions on this route, such as fog, congested waterway through the canal, etc., and the possibility at times of operating outside Cape Cod, the steamers are designed to have a possible speed under maximum power, oil burning, of 19 knots.

WEIGHTS

The carrying capacity in service figures out as follows:

Equipped weight, water in boilers, condenser and piping	4,200 tons
Margin weight for equipped ship	250 tons
Fuel oil (bunker weight)	120 tons
Boiler feed water	70 tons

Culinary water	100 tons
Passengers and their effects	60 tons
Baggage, automobiles, etc.	20 tons
Provisions and stores	20 tons
Crew and their effects	10 tons
Cargo freight	400 tons
Trimming water	50 tons
Total.....	5,300 tons

The displacement on a 16-foot 6-inch draft will be 5,300 tons.

PASSENGERS AND ROOMS

The vessels are designed to carry but one grade of passengers in rooms while separate open spaces will be provided for berth travel of men and women. The total number of regular passenger rooms is 267; number of passengers with two in each room, 534; de luxe rooms with adjoining baths, 14; capacity, with two persons in each, 28; special rooms with adjoining toilet, 64; capacity, with two persons in each, 128. Total number of rooms, 345; total passengers in rooms, 690.

In addition to the stateroom accommodations provision will be made for berth travel for 160 men and 50 women, making the total number of berth travel passengers 210 and the total number of passengers 900. The crew will number, deck department, 46; engine department, 27; steward's department, 95; total crew, 168; total persons on board, 1,068.

These steamers will be equipped with lifeboats in davits with collapsible boats stowed underneath, life rafts not being considered desirable. The lifeboat equipment as designed will consist of four metallic lifeboats, 24 feet by 7 feet by 3 feet with a capacity of 30 persons each, giving a total capacity of 120; 12 metallic lifeboats, 26 feet by 7 feet by 9 feet by 3 feet 4½ inches with a capacity of 40 persons each, providing for a total of 480 persons; 12 collapsible lifeboats, 24 feet by 7 feet by 2 feet with a capacity of 40 persons each, providing for a total of 480 persons. This equipment provides a total boat capacity of 1,080 persons.

GENERAL ARRANGEMENT

The vessels will be twin screw steel sponson sided type passenger steamers with freight space on the main deck and one freight hold. The hulls will be constructed with transverse framing with web frames in conjunction with side stringers. A complete double bottom will extend fore and aft with tanks fitted for water ballast for trimming purposes, fresh water for ship's use and for boiler feed use. There will also be built-in tanks for culinary water and built-in deep fuel oil tanks. The fore and after peaks will be fitted for salt water trimming tanks.

The hull will be divided transversely by seven watertight bulkheads carried up to the main deck, stepped as required and fitted with watertight flats as shown on the plans. There will be one common shaft tunnel with port and starboard tunnel recess.

In view of their service through the Cape Cod Canal, and, due to the possibility of their taking a bad shear and fetching up with their bilges on the banks of the canal, the steamers will be provided with bilge protection through the midship portion of the hull made up of deep fuel tanks abreast the boilers, dry tanks in way of the engine room and cargo double bottom tanks up the sides in Nos. 2 and 3 holds with a longitudinal bulkhead port and starboard in way of the shaft tunnel.

The vessels will be fitted with two light steel masts for wireless and signalling apparatus, one main double smokestack and one ventilating stack, a duplicate of the main smokestack in appearance. The stem will be straight with a slight rake forward. At the saloon deck aft of the stem for about 48 feet light steel bulwarks will be fitted on each side. The stern will be of special type, elliptical in shape

around the guard line with waterline extension over the rudder. The vessels will be fitted with steel guards.

The general arrangement of the accommodations is shown on the plans. The vessels will be equipped with electric light and steam heat throughout.

There will be three freight doors on each side off of the main deck and a freight hatch forward through the main and lower decks to serve the forward freight hold. This hatch will be equipped with an elevator of 4,000 pound lifting capacity running from the tank top to the main deck level operated by an electric winch on the main deck. An elevator of 1,000 pounds lifting capacity will be installed on the port side of the after end of the freight deck for handling stores down to the galley and store room.

At the after end of the engine room on the level of the lower deck will be the ice machine room on the port side and the dynamo room on the starboard side.

PROPELLING MACHINERY

The propelling machinery will consist of two Parsons single reduction gear steam turbines and six cylindrical return tubular Scotch boilers, 16 feet 4 inches inside diameter by 11 feet 8 inches long over top heads, built for a working pressure of 200 pounds per square inch, and one donkey boiler vertical wet uptake type 6 feet inside diameter by about 101 inches high built for 150 pounds per square inch working pressure.

The twin screw turbine propelling machinery will be built from designs as furnished by the Parsons Steam Turbine Company, Ltd., of Wallsend-on-Tyne, in which each set will consist of one high pressure and one low pressure turbine in series each driving a separate pinion through single reduction gearing. Astern turbines of the impulse type capable of developing 60 percent of full ahead power will be incorporated in each low pressure ahead turbine. The revolution of turbines at full power ahead will be high pressure turbine, 1,920 revolutions per minute; low pressure turbine, 1,920 revolutions per minute. At these revolutions the turbines will develop a total of not less than 6,400 shaft horsepower. The speed of the propellers will be 120 revolutions per minute.

The six boilers will be arranged for two fire rooms with grates fore and aft and will be fitted with the Howden system of heated forced draft with heater tubes for raising the temperature of the air before it enters the furnace. The boilers will be connected to one smokestack.

The propellers will be solid right and left hand propellers of manganese bronze three bladed about 13 feet 9 inches diameter.

There will be two main surface condensers each containing 4,800 square feet of cooling surface.

PUMPS

The pumps will be of the Blake-Worthington type of the following dimensions:

- Two main circulating pumps about 14 inches diameter.
- Two main twin beam air pumps, 12 inches by 28 inches by 18 inches.
- Two vertical simplex feed pumps, 18½ inches by 13½ inches by 24 inches.
- One vertical duplex ballast pump, 10 inches by 12 inches by 12 inches.
- One vertical duplex fire and bilge pump, 12 inches by 8½ inches by 12 inches.
- One vertical duplex sanitary pump, 10 inches by 12 inches by 12 inches.
- One vertical duplex fresh water pump, 6 inches by 4 inches by 6 inches.
- One vertical duplex ice machine circulating pump, 6 inches by 4 inches by 6 inches.
- One vertical duplex scuttle butt circulating pump, 6 inches by 4 inches by 6 inches.
- Two vertical duplex brine circulating pumps, 7½ inches by 5 inches by 6 inches.
- One vertical simplex donkey boiler feed pump, 4½ inches by 2¾ inches by 6 inches.
- Two vertical duplex fuel oil service pumps, 7½ inches by 5 inches by 6 inches.
- One vertical duplex fuel oil transfer pump, 7½ inches by 9 inches by 10 inches.
- Three vertical simplex lubricating oil pumps, 8 inches by 10 inches by 12 inches.
- One vertical duplex oil cooler circulating pump, 10 inches by 12 inches by 12 inches.
- Two Metropolitan double tube injectors size about No. 14½.
- One donkey boiler injector Metropolitan double tube type.



Ferryboat Poughkeepsie, Operated by the Westinghouse-Winton Diesel-Electric System, One of the First Commercial Vessels to Be Operated by Electricity

The Electric Ferryboat Poughkeepsie

Economical Operation Secured by Diesel-Electric-Geared Drive Installed in Hullfin Type of Vessel

By William H. Easton*

THE ferryboat *Poughkeepsie*, which is now in operation between Poughkeepsie and Highland on the Hudson River, is one of the most remarkable craft afloat. She is one of the first commercial vessels to be propelled by electricity; she is the first Diesel electric ferry to be put into operation; she is the only Diesel-electric-geared vessel in existence; she is the first to be constructed with a hullfin; and she has been especially designed to act as an ice-breaker. Because of this unusual combination of unique features, she has attracted a great deal of interest in the shipping world. She was completed in September, 1922, but at first was not able to make her required speed. This difficulty has been overcome, however, and she was recently placed in regular service.

Her propelling machinery is, of course, the most important part of her equipment. This consists of two 125-horsepower Winton Diesel engines, each of which drives a 90-kilowatt Westinghouse generator, which in turn furnish power to two 100-horsepower Westinghouse motors geared to the propellers.

FUEL CONSUMPTION LOW

There are several reasons why this form of drive was adopted. The most important is its high fuel economy. There is every reason to believe that the *Poughkeepsie* can develop a brake horsepower per hour on less than a half a pound of oil, whereas she would certainly require over a

pound of oil to develop the same amount of power, if she had the most efficient form of steam engine. In addition, she has no standby losses whatsoever. Consequently, when sufficient data are accumulated it is fully expected that the daily fuel cost of the *Poughkeepsie* will prove to be about one-third of that required by a steam operated vessel of similar power and hull size.

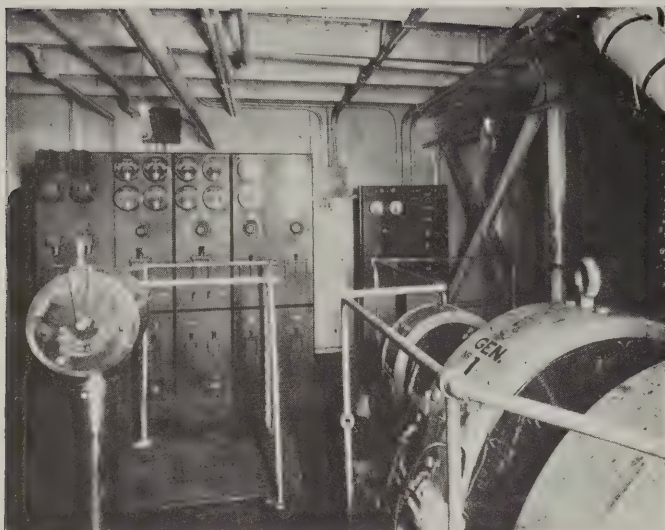
Another advantage is the compactness of the machinery. It can all be contained within the hull without a superstructure, leaving the main deck perfectly clear and providing room for four lines of automobiles in addition to the passenger cabins on either side. The *Poughkeepsie's* car capacity is therefore practically double what it would be with steam propulsion.

VESSEL CONTROLLED FROM PILOT HOUSE

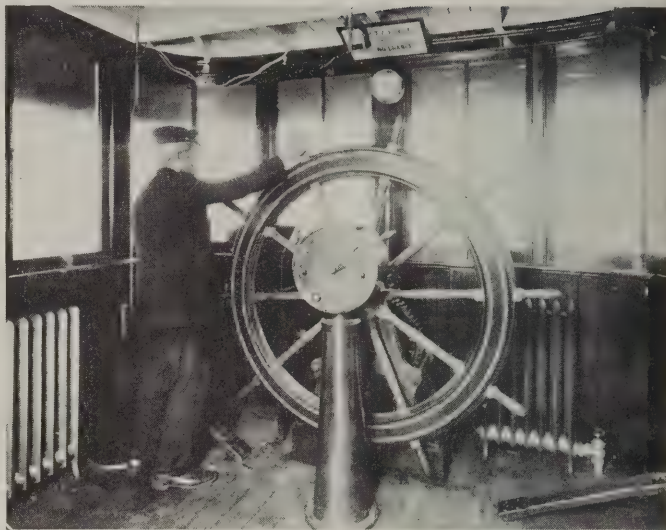
Finally, the pilot has absolute control over the movements of the vessel. By merely moving a small handle located behind the wheel in each pilot house, he can start, stop, reverse, or change the speed of the boat without the loss of an instant's time or the slightest opportunity of having his signal's misunderstood. So quick is this control that the *Poughkeepsie* can be brought from full speed ahead to full speed astern in less than a minute.

To look at the *Poughkeepsie*, she appears to be broad, shoal, and of very light draft. This is not the case, however, for under her visible hull is a second one, known as the

*Westinghouse Electric & Manufacturing Company.



The Poughkeepsie's Main Switchboard, Showing Auxiliary Engine Room Controller



In the Poughkeepsie's Pilot House. The Pilot Controls Every Movement of the Boat by Turning the Handle of the Propeller-Motor Controller Located Behind the Wheel

"hullfin," which is a long and narrow stream-line projection, like an enlarged keel. It contains the propeller motors, gears and shafting, and carries the propellers at its ends. Its chief purpose is to place the propellers under the boat, where they are always immersed in solid water. It also enables the *Poughkeepsie* to act as an ice breaker. Instead of wedging into the ice, as a boat with a standard hull will do, the broad end of the *Poughkeepsie* rides over it, crushes it and then pushes it aside. The position of the propellers on the hullfin prevents them from being injured during the process.

No very heavy ice has been encountered in the river so far this winter, but it is expected that the *Poughkeepsie* can be kept in operation with even the maximum thickness of ice, which sometimes exceeds two feet at this point.

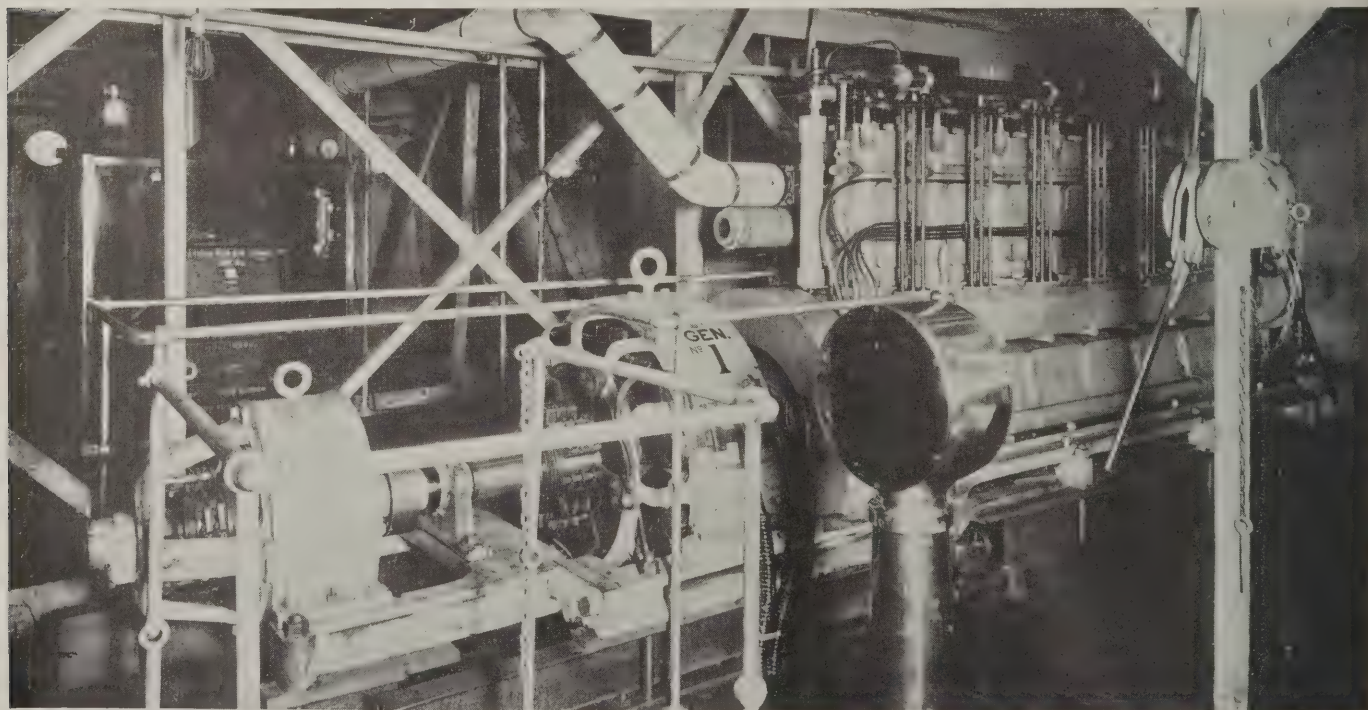
DETAILS OF CONSTRUCTION

The *Poughkeepsie* was built in the Mill Basin, Brooklyn,

yards of the Atlantic, Gulf & Pacific Company for the Poughkeepsie & Highland Ferry Company. She has a length over guards of 140 feet, beam over guards of 52 feet, total draft of 10 feet, hullfin draft of 6 feet, and a displacement of 400 tons. Her hull is of steel and her superstructure of wood with steel supports, trusses and tie rods. At each end of the hull there is a special system of framing and extra heavy plating designed to provide the resistance necessary for the ice crushing service. The hull itself extends to the fender guards furnishing maximum stability and eliminating the overhanging guards and braces in general use.

PROPELLING MACHINERY

The engines are of the Winton model W59 Diesel type, with six $7\frac{1}{2}$ by 11-inch cylinders, and operates at 450 revolutions per minute. The main generators are rated at 90 kilowatts each and supply 250-volt direct current. Two 9-



One of the Poughkeepsie's Two Main Generating Units, Consisting of a 125-Horsepower Winton-Diesel Engine Driving a 90-Kilowatt Westinghouse Generator, with a 9-Kilowatt Westinghouse Exciter

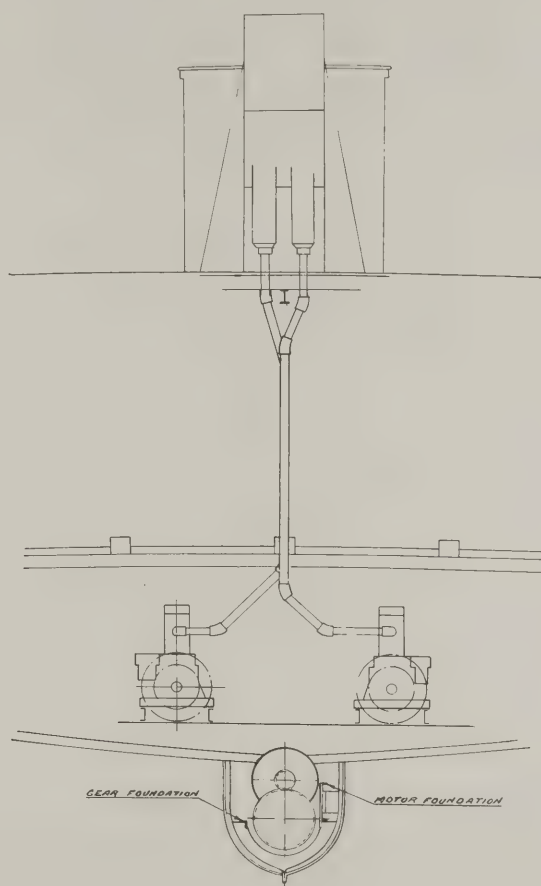
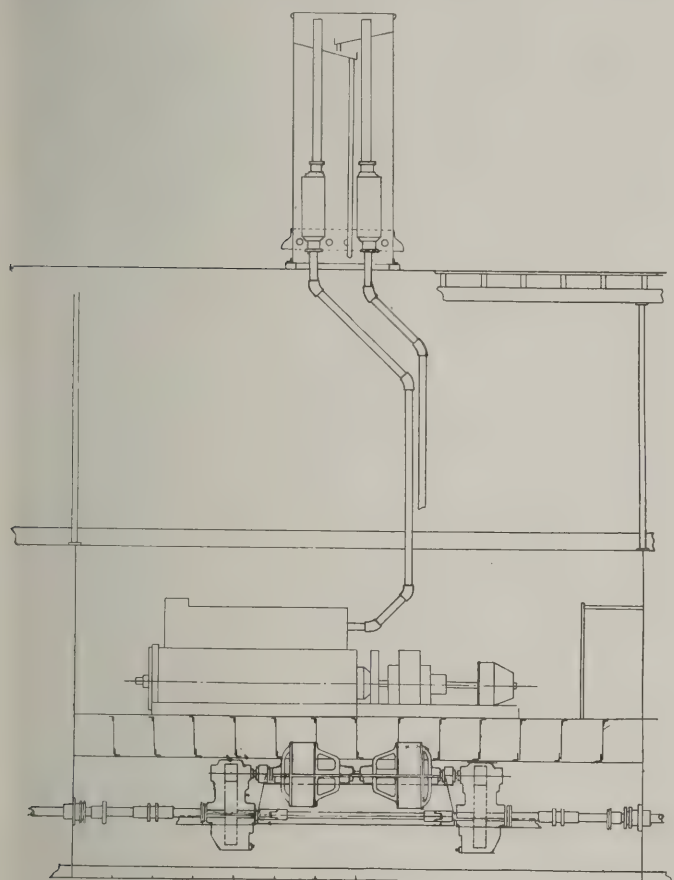
kilowatt Westinghouse generators, driven from the main engines, furnish excitation for the main generators and motors, as well as power for lighting and other purposes when the vessel is in operation.

For use when the main engines are shut down, there is a $7\frac{1}{2}$ -kilowatt gasoline-driven generator. This supplies sufficient power for lights and also for operating a small motor-driven compressor which provides air at 600 pounds pressure for starting the main engines.

The main engines operate continuously at constant speed in one direction only during the operation of the boat, all speed changes in the boat's movements being made by chang-

connected directly to the propeller shaft. It was not possible, however, to obtain full speed with the 48 by 26-inch propellers then used. Messrs. Tams & King were retained as consulting engineers to correct this trouble, and at the suggestion of their Mr. A. B. Raymond, herring-bone gears, giving a $3\frac{1}{4}$ to 1 reduction, were installed between the motors and the propeller shaft, and 60 by 60-inch, semi-steel Kearsfott propellers, to operate at about 220 revolutions per minute were substituted for the original ones.

The result of these changes was the gain of about 45 per cent in the *Poughkeepsie's* speed, so that she now runs at about 9 miles per hour. Normally both motors and both pro-



Arrangement of the Poughkeepsie's Two 100-Horsepower Westinghouse Propeller Motors. The Propeller Shaft Carries a Propeller at Each End, and Both are Normally Operated by the Two Motors. The Motors are Connected to the Gears Through Flexible Couplings. A Universal Joint, Connecting the Two Halves of the Propelling Shafting, Eliminates the Necessity for Perfect Alinement

ing the speed or direction of rotation of the motors. Either or both engines can be used at any time.

A small rheostat, located under the floor of each pilot house and operated by the pilot's controller, controls the motors by varying the voltage and the direction of the main generator field-current supplied by the exciters. The amount of current handled by the rheostat is small, so that the control equipment is very light. In addition to the controllers in the pilot houses, there is a third one in the engine room for emergency purposes. A switch prevents the use of more than one controller at a time. Should the circuit-breakers, which protect the main circuits by opening automatically on overloads, operate and cut off the current to the propeller motors, they are reset by pressing a button located on each controller. All the controlling and switchboard apparatus is of Westinghouse make.

REDUCTION GEARS INSTALLED

As originally designed, the propeller motors, which operate from 600 to 720 revolutions per minute, maximum, were

connected directly to the propeller shaft. It was not possible, however, to obtain full speed with the 48 by 26-inch propellers then used. Messrs. Tams & King were retained as consulting engineers to correct this trouble, and at the suggestion of their Mr. A. B. Raymond, herring-bone gears, giving a $3\frac{1}{4}$ to 1 reduction, were installed between the motors and the propeller shaft, and 60 by 60-inch, semi-steel Kearsfott propellers, to operate at about 220 revolutions per minute were substituted for the original ones.

The result of these changes was the gain of about 45 per cent in the *Poughkeepsie's* speed, so that she now runs at about 9 miles per hour. Normally both motors and both propellers are operated so as to give ample power and eliminate the drag due to the forward propeller, but either motor or either propeller can be cut out, if desired.

In the opinion of Mr. Raymond, this geared arrangement forms an excellent drive and one that deserves careful consideration in designing future boats of this general character. The combined weight of the high speed motors and the gears is less than that of motors of sufficiently slow speed without gears or direct connection to the shaft; a low shaft line is made possible while the motors are raised up where they are accessible, well ventilated, and kept clear of the bilge; perfectly silent operation is obtained at the low peripheral speeds employed; and the life of the gears should be practically unlimited.

EQUIPMENT DETAILS

The two cabins of the *Poughkeepsie* will seat 190 passengers. If traffic demands, these cabins can be put on the upper deck. The heating apparatus consists of an Arcola steam heater. An air-operated Strombos horn is used for

signalling. Fuel-oil tanks with 4,400 gallons capacity—over a month's supply—are located in the compartments at the ends of the hull. The steering gear is of the Thames multiple hand-operated type.

Albert B. Hager, vice-president of the Atlantic, Gulf & Pacific Company, is responsible for the *Poughkeepsie's* construction. Special credit must be accorded S. A. Crum, president of the Poughkeepsie & Highland Ferry Company, for his enterprise in building a boat that marks such an important step in the advance of marine engineering.

Car Ferry Designed to Link Branches of Missouri-Illinois Railroad

IN order to connect the two sections of the Missouri-Illinois railroad, of which ninety miles of main line are in Illinois and forty in Missouri, divided by the Mississippi river, this company recently added the side wheel car ferry *Ste. Genevieve* to its equipment. This ferry was constructed by the Charles Ward Engineering Works, Charleston, W. Va., from designs of Cox and Stevens, naval architects, New York. The ferry is actually intended to act in the capacity of a bridge in handling the traffic of the railroad, which includes a considerable tonnage of coal. The run is extremely short but the ferry will be used continuously so that a craft of rather unusual type was determined upon.

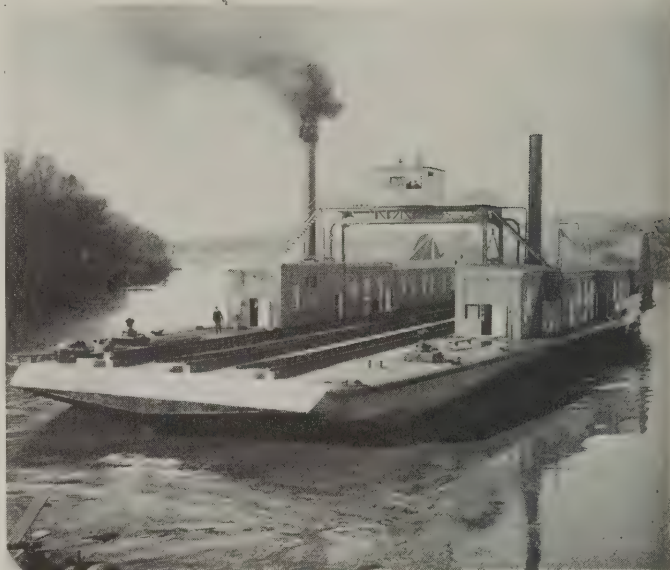
PRINCIPAL DIMENSIONS

The hull is built of steel to the following dimensions: Length, 285 feet; depth, 11 feet; beam, molded, 54 feet; beam over guards, 86 feet. The ferry is of the single deck side wheel type carrying three tracks with a steel deckhouse containing the machinery, boilers and coal bunkers.

The sponsons carrying the outboard bearings to the wheels are supported by a structural frame spanning the track, and the pilot house, which is of wood, is supported by a structural frame forward of the deckhouse.

PROPELLING MACHINERY

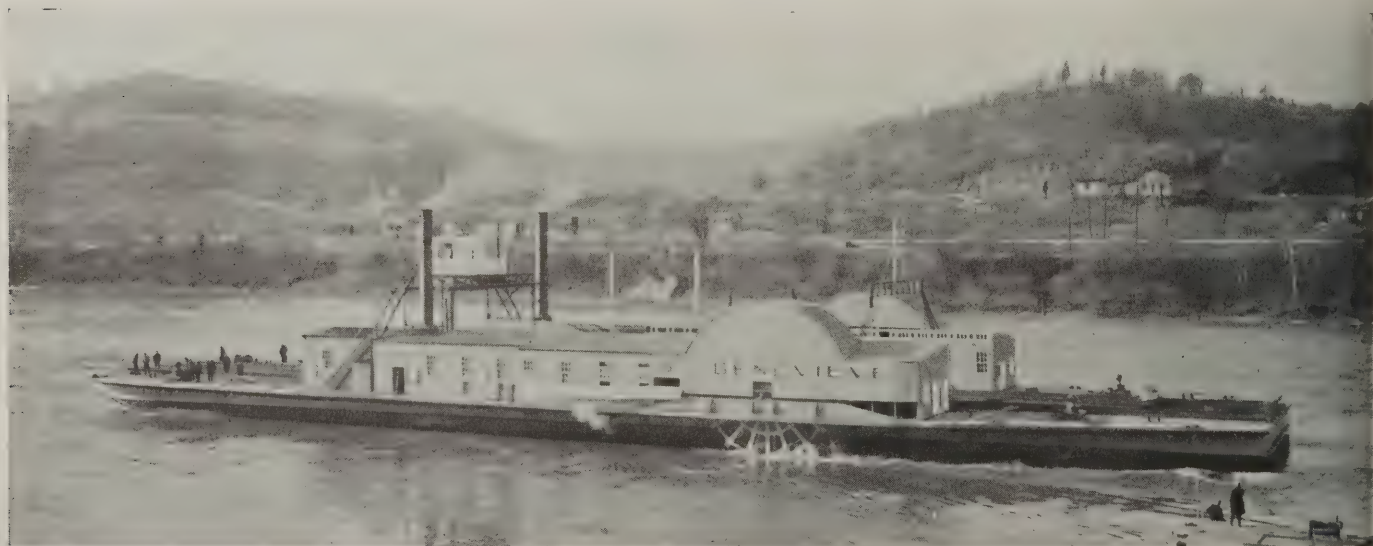
The propelling machinery consists of two simple engines with cylinders 22 inches in diameter by 8 feet stroke for which steam is supplied at 200 pounds per square inch by 6 boilers 44 inches in diameter, 26 feet long, each having ten 6-inch flues. The boilers are equipped with steam jets for cleaning.



Bow View of Car Ferry *Ste. Genevieve* Showing Arrangement of Tracks and Deck Houses Containing the Propelling Machinery

The paddle wheels are 28 feet in diameter by 12 feet wide. Two rudders are fitted aft which operate by hand or steam power. Under the conditions in which the ferry operates it is necessary that when fully equipped, with the bunkers filled and carrying a load of ten cars of 82 tons each, the draft shall not exceed 5 feet. This was the determining factor in calculating the scantlings of the craft. Wherever possible the weight of the structure was kept to a minimum without sacrificing strength. The requirements that the hull shall be sufficiently rigid to permit carrying a locomotive of 160 tons weight added further complication to the problems of design.

In determining upon the engineering features of this ferry careful attention was given to the local conditions under which it would be required to operate—the shortness of the run and the difficulties to be met in navigating the river. It was determined that a simple non-condensing engine with the customary river type of boiler, in view of its simplicity and ruggedness, was the best possible combination of power equipment.



Car Ferry *Ste. Genevieve* Built by Charles Ward Engineering Works for Connecting the Main Line of the Missouri-Illinois Railroad Company Across the Mississippi River

New Railway Dry Dock Operating in Baltimore Repair Yard

AMONG the various forms of ship repair equipment recently taken over by the H. E. Crook Company, Baltimore, Md., from the Union Shipbuilding Company in the operation of the repair facilities of this yard is a new 4,000-ton railway dry dock designed by the Crandall Engineering Company of Boston. This dock was put in commission late in the fall of 1922 when the steamship *Anacortes*, having a displacement of 4,975 tons, was hauled out of the water for repairs. Incidentally, this ship, having a draft of 8 feet 6 inches forward and 15 feet 6 inches aft, was a 25 percent overload for the dock.

The field engineering force of the Crandall Company carried out the construction. The cradle and track are of heavy timber construction built of long-leaf yellow pine and Douglas fir. The general dimensions of the new dock are: Length on keel blocks, 360 feet; breadth, 70 feet; draft on keel blocks forward, 15 feet; draft on keel blocks aft, 20 feet. It is so built that the keel block line is nearly level so that a ship while being docked is in a horizontal position at all times. The entire dock is decked over forming a safe and convenient platform where the men may carry on their work efficiently. Uprights supporting the docking platforms are erected on each side of the cradle. Winches for operating the bilge blocks along the slides are mounted on the docking platforms. The bilge blocks are equipped with a patent releasing mechanism enabling the blocks to be quickly released and replaced under full load.

The track is of the four-way type resting on a foundation of yellow pine piling driven to hardpan and accurately cut to grading. The cradle runs on the track supported on free rollers working on heavy plates attached to the track and the cradle. The under water portion of the track was built



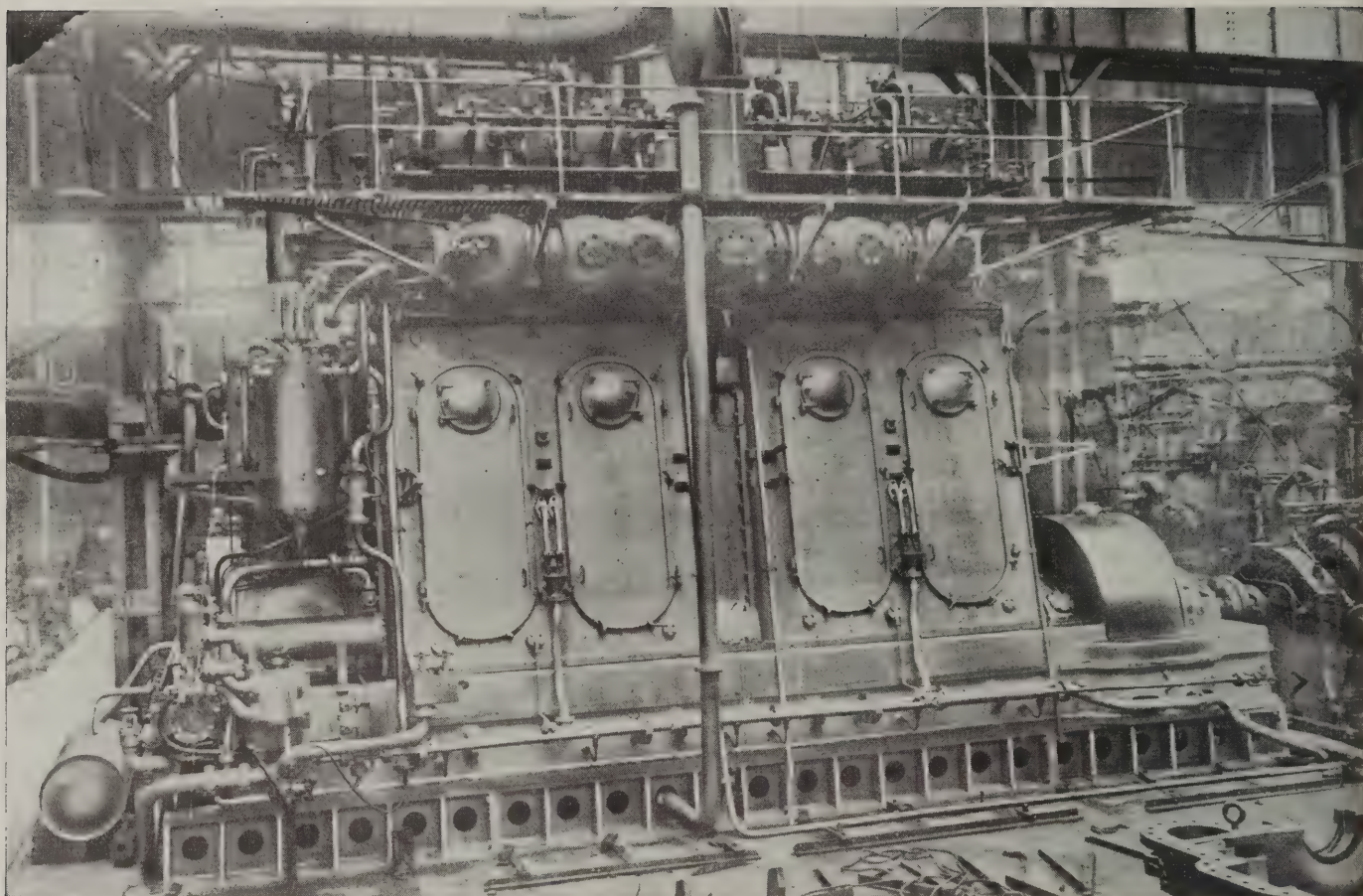
Hauling Out the Steamship *Anacortes*, with a Displacement of 4,975 Tons, on New Crandall Railway Dry Dock in Baltimore

ashore then launched and carefully sunk into place between guides and fastened in position after a further check to assure correct alinement.

The cradle is drawn by six 2¼-inch marine railway chains attached to the cradle by means of an equalizing device which makes the pull on the several chains uniform. A powerful hoisting machine, composed of a train of heavy spur gearing actuated by a 250-horsepower alternating current motor running on 440-volt, 3-phase, 25-cycle current is used to operate the cradle chains. Automatic brakes are provided and also hand brakes for emergency. Two speeds are arranged for hauling the ship out of the water—the slow speed being capable of lifting the full load in forty minutes.



Crandall 4,000-Ton Railway Dry Dock Installed at Yard of Union Shipbuilding Company, Baltimore



Four-Cylinder Stephen-Sulzer Engine, Designed to Develop 1,600 Brake Horsepower

Diesel Engine Developments in Great Britain

By Our Special London Correspondent

There appears a distinct likelihood of competition between two and four cycle Diesel engines becoming much more acute in the near future than it has been in the past. Hitherto the vast majority of motorships have been equipped with machinery operating on the four cycle principle, and it will probably not be an over-estimate to say that 90 percent of the large oil engined ships afloat are equipped with motors of this class. The belief which engineers hold in the future of the two cycle engine is, however, indicated by the fact that among the 20 or 30 firms in the United Kingdom which have taken up the manufacture of large marine oil engines, some 75 percent have decided to adopt the two cycle type.

IN view of the order that was recently placed by the Union Steamship Company of New Zealand, for a 20,000 ton motor liner in which Sulzer two cycle machinery of 13,000 shaft horsepower will be installed, considerable interest attaches to the completion of the first twin screw sets of this type that have been built in Great Britain. Several ships equipped with Sulzer engines are now in service but the machinery in all cases has been built either almost completely or mainly in Switzerland, and not by their British licensees.

On the Clyde, Messrs. Alexander Stephen & Sons, Limited, are now installing two Stephen Sulzer engines each of 1,600 brake horsepower in the motorship *Dalgoma*, an 11,000 ton cargo vessel for the British Indian Steam Navigation Company, which will run her trials at the end of April. At Denny's yard on the same river, the 10,000 ton tanker *Scottish Borderer* is fitting out and in this vessel two Denny Sulzer engines of 1,250 brake horsepower each will form the propelling equipment. In both cases the whole of the machinery has been built by the Scottish firms, only one or two parts such as fuel valves being supplied by Sulzers themselves from their Swiss works.

Curiously enough there are considerable points of difference in the motors built by Stephen's and Denny's respectively, as will at once be seen by an inspection of the illustrations. In the former, what may be taken as the more modern system is adopted. There is no scavenging pump driven direct off the engine and the necessary scavenging air is supplied from separate electrically driven turbo blowers.

SCAVENGING BY TURBO BLOWERS

It may be assumed that the power needed for the operation of these blowers is about 5 to 7 percent of the total output of the main engines. Thus with the two sets operating at full power developing 3,200 brake horsepower an electric motor of 200 brake horsepower driving the blower is found to be suitable. Actually two turbo blowers are fitted, one being a standby and the other supplying the necessary air to both propelling engines. It may be remarked that the construction of the electric motors for this purpose calls for some special care, on account of the fact that they run at 2,750 revolutions per minute and have to be of the direct current type operating on the fixed circuit of 220 volts.

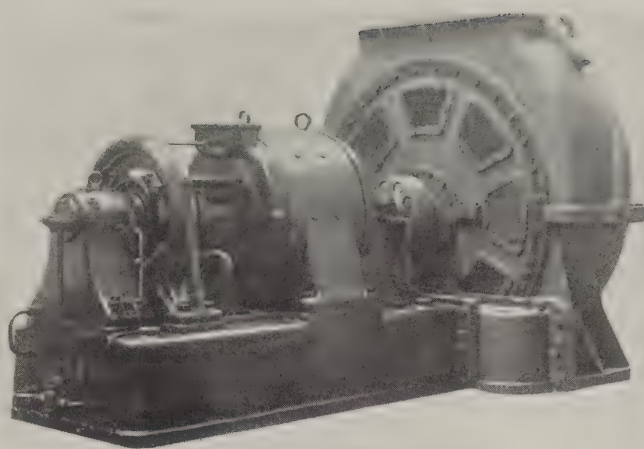
CYLINDER SIZES

These engines have cylinders of 26.77 inches bore and 43.31 inches stroke and run at the relatively low speed of 85 revolutions per minute. Diesel motors with cylinders of the same size, but having a speed of 100 revolutions per minute are now being built, when the output is 2,000 brake horsepower. It is interesting to note that in four Sulzer type engines which are to be installed in the motor liner referred to above, the four cylinders of each engine are of 27.17 inches bore and 38.58 inches stroke, but the speed of revolution is greatly increased, about 135 revolutions per minute being the normal. The output in this case is 3,250 brake horsepower for each engine.

In the Stephen Sulzer motor there is a single two stage air compressor at the forward end and a group of three pumps driven from the crankshaft, two horizontal and one vertical. One of these supplies oil to the crankcase at about 300 pounds per square inch, which is of course much higher than the main lubricating oil supply pressure. Another is a bilge pump and a third a fuel transfer pump. Sea water is utilized for cooling the jackets and covers, while fresh water is employed for the pistons, separate electrically driven centrifugal pumps being installed in the engine room for this purpose.

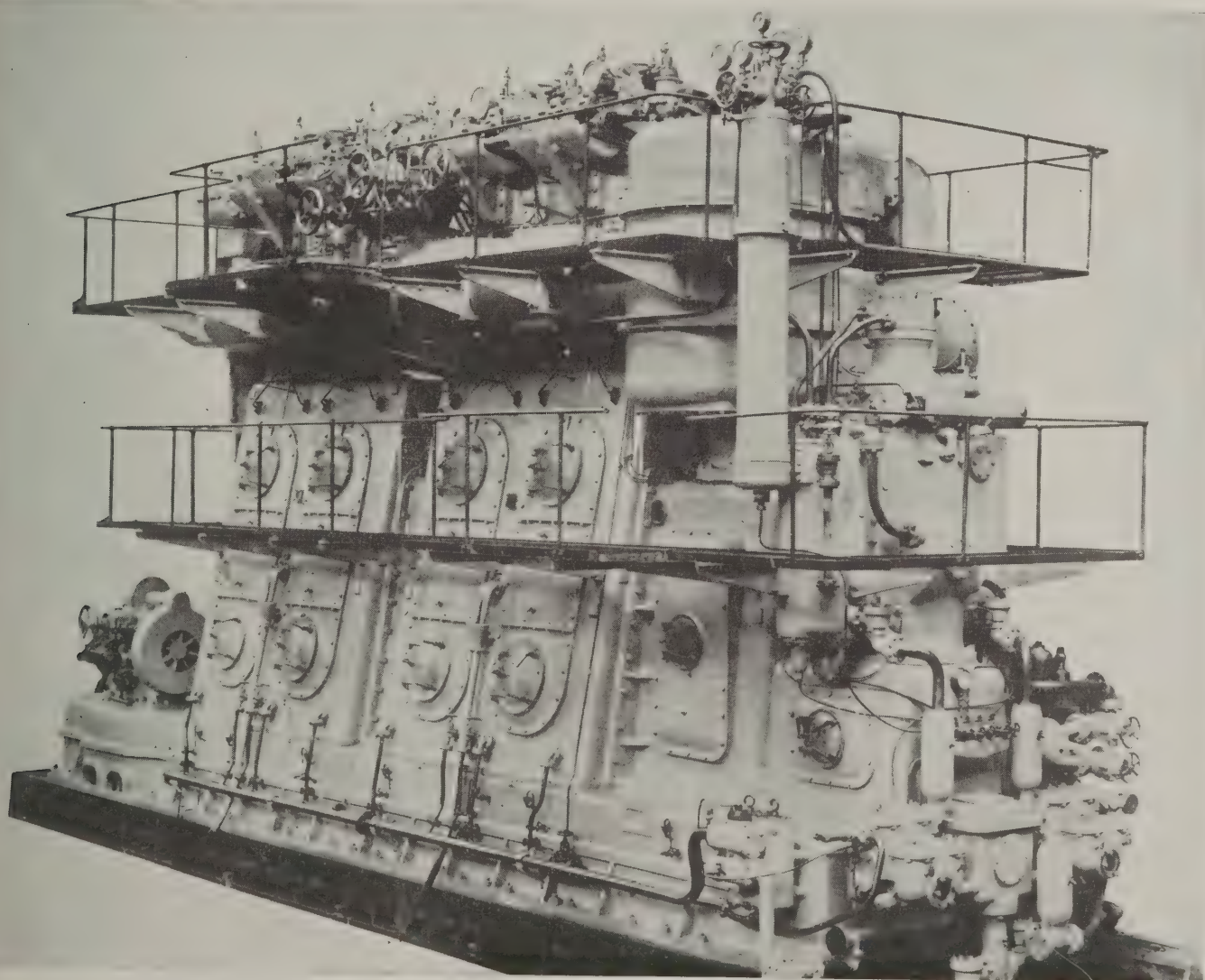
CONTROL LOCATED AT TOP OF CYLINDERS

Unlike most other types of marine Diesel engine, the control station is located on a level with the top of the cylinders.



One of the Turbo Scavenging Blowers Used in Connection with the Stephen-Sulzer Engine

Maneuvering and reversing are carried out in a simple manner since there is only one fuel and one starting air valve in each cylinder actuated by ahead and astern side-by-side cams on the camshaft. The usual Sulzer scavenging system is employed, in which, besides the row of ports in the bottom of the cylinder for the admission of scavenging air, is a further series of supplementary ports above, through



The First Denny-Sulzer Engine. Brake Horsepower at 120 Revolutions per Minute, 1,250

which air is only admitted after the piston has covered the exhaust ports as it has moved upwards.

In the Denny Sulzer engine, turbo blowers are not utilized for scavenging purposes. It will be noted that at the forward end of the engine is arranged a large piston scavenging pump driven off the crankshaft in addition to the three-stage air compressor. There is probably not much difference in weight and cost between the two systems although, if anything, the advantage rests with turbo scavenging. It is, however, generally thought that for most engines, even of big size, turbo blowers will be used in the future. The power of 1,250 brake horsepower is developed at 120 revolutions per minute, the cylinder diameters being $23\frac{1}{2}$ inches and the stroke 41.7 inches.

In the ship in which the two Denny Sulzer engines will be fitted, steam auxiliaries are to be used throughout and it is naturally desired to have as few as possible in operation when the ship is at sea since oil fired boilers are notoriously uneconomical. The engine is therefore made self-contained and the group of three pumps at the forward end referred to in connection with the Stephen Sulzer engine are utilized for other purposes. One pump is for supplying cooling water to the cylinder jackets and covers, another serves as a bilge pump and the third as a main lubricating oil pump.

At the back of the engine, driven by levers from one of the crossheads is another group of pumps for piston cooling water, crosshead lubrication and the transfer of fuel respectively. Thus when the vessel is at sea no independently driven auxiliaries are needed apart from the small steam driven dynamo supplying current for electric light throughout the ship. Another point in favor of steam driven auxiliaries is that they are less costly although far less

economical in fuel. There are, however, special reasons for using steam for this purpose in tankers on account of the suitability of steam engines for driving the cargo pumps, but generally speaking the employment of electricity for operating all the auxiliaries on modern motorships is now becoming almost universal.

FASTEST TRANSATLANTIC MOTOR LINERS NOW POSSIBLE

It is a matter of interest that, based upon their experience with a single cylinder 2,000 brake horsepower two cycle engine which Sulzers built some years ago, they have now designed eight cylinder motors of 10,000 brake horsepower which it is understood will be built under the usual guarantee. Thus with a quadruple screw arrangement the fastest transatlantic liners could be equipped with Diesel machinery.

The engine in question would develop its power at 170 revolutions per minute and have cylinders of 33.47 inches diameter and 43.31 inches stroke. The mechanical efficiency would be 74 percent and the indicated horsepower 12,600. The weight of the engine without accessories would be 525 tons and scavenging air would of course be supplied from electrically driven turbo blowers. The piston speed would be 1,230 feet per minute, which is admittedly somewhat high and the mean indicated pressure about 95 pounds per square inch. For each engine the power absorbed by the blower would be 700 brake horsepower.

In a quadruple screw arrangement of 40,000 shaft horsepower there would be four auxiliary engines each of 1,000 brake horsepower driving dynamos. These would run at 240 revolutions per minute. The proposal is interesting as showing the confidence which Diesel engine builders now feel in developing motors of large power.

High Pressure Gas Regulator

FOR the control and delivery of acetylene, oxygen, hydrogen and other high pressure gases, the Alexander Milburn Company, Baltimore, Md., has developed the gas regulator shown. Features of this device are said to be simplicity, ease of assembly, direct action and accurate regulation.

The regulator comprises a front cap containing an adjusting key, top spring button and tension spring. The body contains a flexible metal diaphragm in front, soldered in place. Over the diaphragm is screwed a bronze diaphragm plate or spring button to hold the tension spring. Inside the body is a fixed nozzle, containing a loose operating pin. Over the nozzle is loosely assembled the valve sleeve which has a row of gas ports drilled around its circumference and carries the valve seat. The seat closes against the nozzle by initial gas pressure on the valve sleeve and the pressure of a compensating spring resting in the recessed back cap.

The loose operating pin inside the nozzle is actuated at one end by a depression of the diaphragm and at the other end by pressure of the valve seat.

The seat of the regulator closes *with* instead of *against* the pressure, enabling the seating to be effected by a sealing pressure of several pounds instead of hundreds of pounds with attendant risk of damaging or splitting the seat, as in the case of regulators where the seat is yoked to the diaphragm. The closing of Milburn seat is independent of the diaphragm.

The valve is closed by the rear pressure of the compensating spring, assisted by initial gas pressure. When the adjusting key is turned to the right, the tension spring depresses the diaphragm, moving the loose pin, which forces the sleeve back, unseating the valve and permitting gas to enter through ports in the sleeve. The gas then passes through the nozzle to the diaphragm chamber and thence

to the low pressure gage and through the outlet port. When multiplied gas pressure exceeds the tension of the adjusting key spring, the diaphragm is released, permitting the loose pin to advance and letting the valve sleeve close the valve by pressure of the rear compensating spring.



Milburn High Pressure Gas Regulator

Selection of the Best Kind of Propelling Machinery*

Comparison of Vessels Equipped With Various Types of Propelling Machinery — Discussion of Factors Influencing Selection of Best Type

By J. L. Ackerson†

NEVER before has the marine engineering fraternity had so many different types of propelling machinery to select from, and there is no empirical formula which can be applied to help select the best type. The problem of the shipowner in this respect is the most important one he has today. Among the many factors to be considered in deciding what is the most suitable type are reliability (this is the most important single factor, for without reliability other advantages are very much discounted); economy in operation, initial cost, and weight, the relative importance of the last three depending on the type of ship under consideration.

RELIABILITY

Reliability is something less tangible than the other three and responsibility less easily placed, because the factors controlling reliability emanate from two different sources: (1) The owner, through the selecting of competent personnel; and (2) the builder. No matter how well a machine has been designed and constructed, if placed in the hands of an incompetent operator, it will become unreliable; and *vice versa*, no matter how good the operating engineer, if the proper factors have not been used in the design and care in the construction, then the machinery is again unreliable; so that it is absolutely necessary for the operator thoroughly to understand and be whole-heartedly in support of any new design, and for the designer to realize that the cost of fuel per horsepower, while important, is not the only consideration. In the past five years we have had a very costly experience through sending to sea a large number of units (the design of which to begin with is questionable) in charge of engineers who were only half trained.

ECONOMY

Economy in operation (that is, the fuel per horsepower) and initial cost usually bear a very close relation to each other, and it is only a question of figures to determine whether any particular type is worth the money as compared with any other type; and here again the type of vessel and the trade the vessel is employed in play an all-important part, as for example, most tramp steamers over a cycle of, say seven years, are laid up for considerable periods at a time owing to there being no freight. During this lay-up the portion of expense due to fixed charges is going on all the time, while that portion consisting of fuel and supplies and operating personnel stops when the ship is laid up.

WEIGHT

Weight is the least important except in the case of special types like shallow-draft boats, express-type steamers, warships, etc., because except in special trades—*viz.*, coal, ore or oil-carrying—it is seldom that a ship is loaded down to a loaded draft mark, even when full of cargo.

With this brief introduction I will now present comparisons of the following different types of machinery and ships:

Geared turbines with Scotch boilers.

Geared turbines with watertube boilers.

Reciprocating steam engines with Scotch boilers.

Reciprocating steam engines with watertube boilers.

Diesel engine 4-cycle.

Diesel engine 2-cycle.

For 5,000-ton freighter at 10½ knots.

For 7,500-ton freighter at 11 knots.

For 8,800-ton freighter at 10½ knots.

For 10,000-ton freighter at 12½ knots.

For 10,500-ton tanker at 10½ knots.

For 17,000-ton displacement passenger ship at 15 knots.

From Table I the one outstanding feature is the greater savings for Diesel-engine ships in the long-voyage trades, and this is chiefly due to the saving of cargo space required for carrying fuel oil rather than to the saving in cost of fuel oil, operating personnel, and fixed charges. Also, that for short voyages the Diesel engine should be given very careful consideration before a selection of the type to be used is made.

The different comparisons show that there is not much difference between the weight of Diesel engines and steam reciprocating engines, but it should be borne in mind that for steamers up to 12 knots speed the revolutions per minute of the Diesel engine are considerably higher than those of the corresponding steam engines—in the ratio of about 110 to 75. This undoubtedly means a less efficient propeller for all single-screw types. On faster boats the advantages of the slower revolutions per minute gradually disappear. In comparing weights, allowance should be made for reserve feed water for the steamer; if this is done, steam-engine weights will invariably be greater than Diesel-engine weights for voyages of ten days and over, except in the case of larger power geared-turbine jobs than those now under consideration.

It should also be noted that, whereas powers of four to five thousand are possible on single-screw steam installations, it is necessary to go to twin-screw installations for Diesel engines. This incurs an extra cost in hull construction, necessitating two shaft alleys which cut up the after holds and make it more difficult to stow cargo, as well as actually decreasing the cubic of the holds.

Originally it was my intention to resolve the saving in cargo space due to fuel-oil requirements into dollars per year, but owing to the uncertainty of freight rates I gave up the idea as being impracticable and have shown this advantage in tons per voyage. The alternative to carrying this large quantity of fuel oil would be to buy it at the ports of call. Which choice would be the better would depend, of course, on the price of the fuel oil at, and the freight rate to, those particular ports.

The initial costs listed in Table I may be open to criticism, owing to prices being so spotty and varied at the present time. These prices are based on firm quotations of the lowest reputable bidder and include machinery installed ready for use. The same remark applies to weight. Different builders vary considerably, but, whatever error there is, the percentage of error will be the same for all types and will be in the same direction; and as it is the difference in cost and the difference in weight which we are most interested in, the percentage of error will be very small.

The machinery weights do not include hull engineering or any portion of the machinery usually located in the engine room but necessary for deck machinery only, such as auxiliary generating sets for generating electricity to be used on electric deck machinery.

* Paper read before the Society of Naval Architects and Marine Engineers, New York, November 9, 1922.

† Vice-president, Merchant Shipbuilding Corporation, Chester, Pa., and president, Atlantic Coast Shipbuilders' Association.

TABLE I

Type of Ship	Machinery		Cost of Fuel at Sea per Day	Cost of Fuel per Year		Cost of Operating Personnel	Depreciation Charges 15%	Total Cost per Day	Water Up Tank Capacity, Tons	Fuel Oil Required for Following Distances Allowing 15% Margin, Tons	Cargo Space Taken Up for Fuel Oil for Following Distances, Tons							
	Type	Weight, Tons		In Port	Total													
10,000 Ton Freighter 12 1/2 Knots, Single Screw	R. E. & S. B. 1,650 I.H.P.	380	\$167,000 22 tons	\$44,000	\$1,650	\$45,650	\$25,000	\$81,590	0	440	880	1,320	1,760	0	200	640	1,080	
	R. E. & W. T. B.	316	\$163,000 22 tons	44,000	1,650	45,650	24,500	84,070	0	440	880	1,320	1,760	0	200	640	1,080	
	G. T. & S. B. 1,650 S.H.P.	355	\$175,750 22 tons	44,000	1,650	45,650	26,400	85,970	0	440	880	1,320	1,760	0	200	640	1,080	
	G. T. & W. T. B. 1,710 S.H.P.	291	\$171,000 22 tons	44,000	1,650	45,650	25,600	85,170	0	440	880	1,320	1,760	0	200	640	1,080	
	4 Cycle Diesel... 1,500 S.H.P.	400	\$207,000 7 1/4 tons	16,800	495	17,295	31,000	60,655	0	145	290	435	580	0	0	0	0	
	2 Cycle Diesel... 2,220 S.H.P.	350	\$222,000 7 1/4 tons	16,800	495	17,295	32,000	62,855	0	145	290	435	580	0	0	0	0	
	R. E. & S. B. 2,700 I.H.P.	625	\$230,000 34 tons	68,000	1,650	69,650	34,500	118,430	8	650	1,300	1,950	2,600	1,038	0	262	912	1,562
	R. E. & W. T. B. 2,700 I.H.P.	538	\$224,000 34 tons	68,000	1,650	69,650	33,600	117,530	8	650	1,300	1,950	2,600	0	262	912	1,562	
	G. T. & S. B. 2,500 S.H.P.	570	\$244,000 34 tons	68,000	1,650	69,650	36,600	120,530	8	650	1,300	1,950	2,600	0	262	912	1,562	
	G. T. & W. T. B. 2,500 S.H.P.	483	\$239,000 34 tons	68,000	1,650	69,650	35,800	119,730	8	650	1,300	1,950	2,600	0	262	912	1,562	
8,800 Ton Freighter 10 1/2 Knots, Single Screw	4 Cycle Diesel... 2,500 S.H.P.	650	\$307,000 11 tons	26,090	490	26,490	46,000	85,210	0	210	420	630	840	0	0	0	0	
	2 Cycle Diesel... 3,270 S.H.P.	540	\$327,000 11 tons	26,000	490	26,490	49,000	88,210	0	210	420	630	840	0	0	0	0	
	R. E. & S. B. 2,700 I.H.P.	625	\$230,000 34 tons	68,000	1,650	69,650	34,500	118,430	8	680	1,360	2,040	2,720	1,140	0	220	900	1,580
	R. E. & W. T. B. 2,700 I.H.P.	538	\$224,000 34 tons	68,000	1,650	69,650	33,600	117,530	8	680	1,360	2,040	2,720	0	220	900	1,580	
	G. T. & S. B. 2,500 S.H.P.	570	\$244,000 34 tons	68,000	1,650	69,650	36,600	120,530	8	680	1,360	2,040	2,720	0	220	900	1,580	
	G. T. & W. T. B. 2,500 S.H.P.	483	\$239,000 34 tons	68,000	1,650	69,650	35,800	119,730	8	680	1,360	2,040	2,720	0	220	900	1,580	
	4 Cycle Diesel... 2,500 S.H.P.	650	\$307,000 11 tons	26,090	490	26,490	46,000	85,210	0	220	440	660	880	0	0	0	0	
	2 Cycle Diesel... 3,270 S.H.P.	540	\$327,000 11 tons	26,000	490	26,490	49,000	88,210	0	220	440	660	880	0	0	0	0	
	R. E. & S. B. 4,600 I.H.P.	910	\$363,000 57 tons	114,000	3,300	117,300	54,500	186,440	12	910	1,820	2,730	3,640	1,090	0	730	1,640	2,550
	R. E. & W. T. B. 4,600 I.H.P.	750	\$352,000 57 tons	114,000	3,300	117,300	53,500	185,440	12	910	1,820	2,730	3,640	0	730	1,640	2,550	
10,000 Ton Tanker 11 Knots, Single Screw	G. T. & S. B. 4,200 S.H.P.	780	\$346,000 47 tons	94,000	3,300	97,300	52,000	163,940	12	760	1,520	2,280	3,040	0	430	1,190	1,950	
	G. T. & W. T. B. 4,200 S.H.P.	620	\$336,000 47 tons	94,000	3,300	97,300	50,500	162,440	12	760	1,520	2,280	3,040	0	430	1,190	1,950	
	4 Cycle Diesel... 3,400 S.H.P.	500	\$524,000 15 tons	33,600	495	34,095	78,600	128,835	0	256	512	768	1,024	0	0	0	0	
	2 Cycle Diesel... 5,470 S.H.P.	800	\$547,000 15 tons	33,600	495	34,095	82,200	132,435	0	256	512	768	1,024	0	0	0	0	
	R. E. & S. B. 2,750 I.H.P.	587	\$337,000 34 tons	102,000	650	102,650	35,500	152,430	8	650	1,300	1,950	2,600	650	1,300	1,950	2,600	
	R. E. & W. T. B. 2,750 I.H.P.	500	\$228,000 34 tons	102,000	650	102,650	34,200	151,130	8	650	1,300	1,950	2,600	650	1,300	1,950	2,600	
	G. T. & S. B. 2,500 S.H.P.	532	\$253,000 34 tons	102,000	650	102,650	38,000	154,930	8	650	1,300	1,950	2,600	650	1,300	1,950	2,600	
	G. T. & W. T. B. 2,500 S.H.P.	445	\$246,000 34 tons	102,000	650	102,650	37,000	158,930	8	650	1,300	1,950	2,600	650	1,300	1,950	2,600	
	4 Cycle Diesel... 2,500 S.H.P.	653	\$330,000 11 tons	39,000	195	39,195	49,500	101,415	0	210	420	630	840	210	420	630	840	
	2 Cycle Diesel... 3,520 S.H.P.	545	\$352,000 11 tons	39,000	195	39,195	52,600	104,515	0	210	420	630	840	210	420	630	840	
17,000 Ton Passenger 15 Knots, Twin Screw	R. E. & S. B. 8,000 I.H.P.	1,700	\$720,000 94 tons	188,000	3,300	191,300	108,000	332,240	16	1,300	2,600	3,900	5,200	1,200	100	1,400	2,700	4,000
	R. E. & W. T. B. 8,000 I.H.P.	1,400	\$700,000 94 tons	188,000	3,300	191,300	105,000	329,240	16	1,300	2,600	3,900	5,200	0	100	1,400	2,700	4,000
	G. T. & S. B. 7,200 S.H.P.	1,440	\$580,000 77 tons	154,000	3,300	157,300	87,000	277,240	16	1,075	2,150	3,225	4,300	0	950	2,025	3,100	
	G. T. & W. T. B. 7,200 S.H.P.	1,140	\$560,000 77 tons	154,000	3,300	157,300	84,000	274,240	16	1,075	2,150	3,225	4,300	0	950	2,025	3,100	
	4 Cycle Diesel... 7,200 S.H.P.	1,840	\$800,000 31 tons	72,000	495	72,495	120,000	219,495	0	435	870	1,305	1,740	0	0	105	540	
	2 Cycle Diesel... 8,550 S.H.P.	1,510	\$855,000 31 tons	72,000	495	72,495	128,000	228,495	0	435	870	1,305	1,740	0	0	105	540	
	R. E. & S. B. 8,000 I.H.P.	1,700	\$720,000 94 tons	188,000	3,300	191,300	108,000	332,240	16	1,300	2,600	3,900	5,200	0	100	1,400	2,700	4,000
	R. E. & W. T. B. 8,000 I.H.P.	1,400	\$700,000 94 tons	188,000	3,300	191,300	105,000	329,240	16	1,300	2,600	3,900	5,200	0	100	1,400	2,700	4,000
	G. T. & S. B. 7,200 S.H.P.	1,440	\$580,000 77 tons	154,000	3,300	157,300	87,000	277,240	16	1,075	2,150	3,225	4,300	0	950	2,025	3,100	
	G. T. & W. T. B. 7,200 S.H.P.	1,140	\$560,000 77 tons	154,000	3,300	157,300	84,000	274,240	16	1,075	2,150	3,225	4,300	0	950	2,025	3,100	

R. E.—Reciprocating Engine
G. T.—Geared Turbines

S. B.—Scotch Boilers
W. T. B.—Water Tube Boilers

R.E.—Reciprocating Engine
G.T.—Geared TurbinesS.B.—Scotch Boilers
W.T.B.—Water Tube Boilers

I have not given the cubic required for the machinery space, because in all cases the space required is so near the 13 percent required by the United States tonnage rules as not to justify the loss of the 33 percent deduction to gross tonnage, which is permitted when machinery space is at least 13 percent of the cubic of the ship.

I have not dealt with the engines which offer the greatest saving in space and weight, because up to the present time none has been built in this country, but it would appear to me that the opposed piston type of engines like the Fullagar and the Doxford offer many advantages that cannot be overlooked by the prospective shipowner.

From reports available, the *Yngaren*, fitted with a 3,000-horsepower opposed piston-type engine, made by the Doxford Company, has given an excellent account of herself for her maiden voyage from the British Isles to Australia and back. This engine offers one or two very desirable features, *viz.*, a slow-running engine for comparatively large powers, with the consequent efficient propeller, considerably smaller engine-room space and one shaft alley only.

Owing to the Diesel engine builders standardizing around an engine of 2,500 shaft horsepower, I have used this power upon ships of 7,500 to 8,800 tons and on a 10,500-ton tanker. This assumption makes machinery for these types cost and weigh about the same but gives us slightly different speeds. (The above figures hold good only so far as new machinery is concerned.)

It so happens, however, that at the present time there is hanging over the market a very large tonnage owned by the Emergency Fleet Corporation and available at very much lower prices than the present actual cost for replacing the same.

To convert any one of these 7,500 to 12,000-ton steamers into Diesel engine-driven boats, with 2,500 shaft horsepower Diesel engines, maintaining the existing auxiliary steam-driven machinery and deck machinery, would cost approximately \$400,000, and this same change, together with changing the auxiliaries and deck machinery to the electric drive, would cost in the neighborhood of \$550,000.

The first proposal would save the shipowner approximately 18 tons of oil a day; the second would save him about 22 tons of oil a day. For 200 days a year at sea and 165 days in port at \$10 a ton for oil, the total saving for steam auxiliaries and Diesel propelling engines in oil would be about \$36,000, and the extra for fixed charges would be \$60,000. For Diesel propelling engines and electric deck machinery the initial cost would be in the neighborhood of \$550,000. Saving in fuel oil would be 22 tons for 200 days and 5 tons for 165 days at \$10 a ton—\$53,000—and the extra due to fixed charges would be \$83,000. The extra cost of lubricating oil for the Diesel engine will be offset by the decrease in cost of operating personnel, so that, assuming the same price, whether the owner will run the ship as a motorship or as a steamship, the conversion is not justifiable except for the long voyages; but if these ships can be bought for conversion purposes at \$30 a ton less than would be paid to continue as steamships, the fixed charges are reduced on a 10,000-ton ship to \$37,000, and for almost any trade this change would be justifiable.

For conversion from steamers to motorships under the Shipping Board plan, where new Diesel machinery must be had, it would appear that the larger boats offer the best possibilities.

Before closing I should like to say that, while I have taken 200 days at sea and 165 days in port per year for all the types except the tanker, this figure must, of course, depend on the trade the vessel is employed in. There are some trades where a ship is in port almost half the time, and it must be remembered that while a ship is in port it is not earning anything while the fixed charges are still going on. Therefore the more costly propelling machinery is at a disadvantage as

compared to a cheaper type running only a small portion of the time.

While I consider Table I a good guide, the only way the best type can be selected is by a careful comparison of the different types in the particular trade an owner wishes to engage in along the lines given in the table, taking into account the character of the freight, length of voyage, freight rates, cost of fuel oil at ports of call, etc.

Diesel Engine Electric Ship Propulsion*

By W. H. Wild†

SINCE 1904 there have been completed and placed in service approximately eight hundred motorships above two hundred brake horsepower capacity each and, no doubt, the fuel economy of the Diesel engine, as compared with steam driven machinery, has been the greatest factor in this rapid development.

Diesel electric drive permits of single screw operation, even though more than one engine is used, and the most efficient propeller speeds may be adopted regardless of the number or speed of the engines used. This means it will be possible to standardize the engine, and the designing engineer is at liberty to produce the most efficient and reliable engine without limitation as to speed or size. The engine that lends itself best for manufacture may be adopted and then install two, three, four or more engines depending on the power required. This will reduce the cost of manufacture.

SAVINGS IN WEIGHT AND SPACE

In some ships space and weight are of prime importance. The electric drive does not require the generating sets to be placed in any definite position with respect to the propeller shaft and, therefore, the equipment can be installed to the very best advantage. The question of weight is largely dependent on the rotative speed of the engine and since the electric drive permits using a multiplicity of engines it will be found that the weight of the complete equipment including the electric apparatus will frequently be in favor of the electric drive.

The loss of energy in the electrical apparatus is often pointed out as a serious handicap. This loss, in direct current equipments, may amount to as much as 17 percent, and with alternating current equipments somewhat less, when compared with direct connected propellers running at a speed which is suitable for the highest propeller efficiency. This loss is offset in electric driven ships by using single screws in place of twin screws; adopting the most efficient propeller speed; the most efficient engine speed, and in many other ways. When less than full speed is required one or more units may be shut down thereby effecting a large saving in operating costs.

PILOT HOUSE CONTROL POSSIBLE

The maneuvering advantages of electric drive are of considerable importance for many types of ships such as barges, tugs, fishing boats, ferries, coastwise ships, etc. It also provides a simple means of cutting engines out of service for overhaul at sea or for making simple adjustments. Pilot house control can readily be installed, if desired.

Nearly all motorships are being fitted with electric auxiliaries and Diesel driven auxiliary generators. The auxiliary generating units may often be dispensed with in the electric driven ship with the possible exception of a small set for port use; the main engine generators being used for supplying auxiliary power. In many ships this would permit a saving of thousands of dollars in first cost as well as

*From a paper read before the Ocean Engineers' Association, New York.
†Marine Department, General Electric Company, Schenectady, N. Y.

a large saving in upkeep. This advantage is of greater or less importance, of course, depending on the relation of auxiliary power required as compared to the main propelling power.

RELIABILITY AND CONTINUITY OF SERVICE

Finally, those interested in marine activities desire most reliability or continuity of service. The equipment which can demonstrate the greatest reliability, with the other characteristics reasonably comparable, is bound to find an important place in ships' drive. As for the electrical equipment the major part of all movement is simple rotation, which enhances the great reliability of this apparatus. It has been in successful operation for years on land in every conceivable power application and in the past 10 years thousands of horsepower have been applied to the successful propulsion of ships.

When the electric drive is applied to motorships it is the practice to install two or more engine-generators and mount two motors on the propeller shaft of single screw ships which in reliability is equivalent to a twin screw ship except for the fact that but one propeller is used. Therefore, while the power is generated by engines which involve reciprocating motion, the power is transmitted to the propeller shaft through a motor which involves simple rotation only, and the generating plant can be composed of a sufficient number of units to insure 100 percent continuity of service without sacrificing its economy.

Electric Submerged Log

AN electro mechanical log which will register accurately at low speeds of a vessel is being manufactured by the Electric Submerged Log Company, 33 and 35 Eastcheap, London, E. C. 3, England. The log consists of an electro mechanical device fitted to the hull of a ship at a predetermined depth and at a point where wave and propeller disturbances do not occur. The principle upon which the device works is the conversion of the mechanical action

of a small rotator into electric impulses which are transmitted by wire to a registering device in the wheel house.

The submerged unit of the equipment is connected to the hull of the vessel so that a short section containing the rotator projects outside the hull while another part is inside the vessel. The interior mechanism includes a flange, sluice valve, main tube, stuffing box and a handle. The exterior mechanism comprises a submerged support, an electrical contact casing and the rotor. The contact casing contains the terminal contact of an insulated wire connected to the batteries and the indicating apparatus. An insulated spring makes contact with the commutator or make-and-break disk. The rotator is secured to its ring by a key and screw, the motion being transmitted from the shaft through double worm and wheel gears to the make-and-break disk. This disk makes twenty revolutions per mile of ship's travel.

The distance registering apparatus in the wheel house is calibrated to indicate distances of one-twentieth of a mile corresponding to the rotation of the make-and-break disk up to 10,000 miles. A panel comprising a voltmeter and table of speeds is also provided, with three switches used to connect the voltmeter to a test battery, to connect the recording dial in circuit and to connect a buzzer used for determining the speed of the vessel. This buzzer gives an audible signal every twentieth of a mile traversed and, with the aid of a stop watch, the actual speed can readily be determined.

Notes on Sublimed Blue Lead

SUBLIMED blue lead in the dry state as it comes from the smelter is used in the manufacture of paints and rubber. The Eagle-Picher Lead Company sells the dry product to paint manufacturers and to rubber manufacturers. It also grinds the sublimed blue lead with pure raw linseed oil and markets it in paste form ready to mix with oil, drier and thinner for rust-proofing purposes.

LINSEED OIL

The vehicle is just as important as the pigment in determining the quality of a rust-proofing paint. There has been a long sustained effort on the part of paint technicians to develop other oils that could be substituted for a linseed oil, but up to the present time there is no oil that can be counted on to give the service that can be obtained with pure raw linseed oil.

Boiled linseed oil is specified by many for use with Sublimed Blue Lead because it dries quicker. Raw linseed oil can be given the same drying characteristics by adding suitable drier, and many believe that superior durability is obtained with raw oil.

Linseed oil has been exhaustively studied and engineering specifications for judging its suitability for paint surfaces have been prepared by, and may be obtained from, the American Society for Testing Materials.

PHYSICAL PROPERTIES OF SUBLIMED BLUE LEAD

Dry sublimed blue lead is a slate gray colored pigment of an almost impalpable fineness. With the exception of lamp black, sublimed blue lead is the finest pigment in use today, the particles being of the order of 0.0002 millimeter (0.2) in diameter. An idea of how small this really is may be obtained by comparing this with cement particles. Ordinary dry cement leaves approximately 22 percent on a 200-mesh screen, while sublimed blue lead will pass completely through a 325-mesh screen. A 200-mesh screen has 40,000 holes per square inch, while a 325-mesh screen has 106,000 holes.

The specific gravity of sublimed blue lead is 6.67, that is, it weighs 6.67 times as much as an equal volume of water. One solid gallon weighs 55.56 pounds and one pound bulks 0.018 of a gallon.



Registering Device and Submerged Unit of Electro Mechanical Log

Propellers

How the Design of Propellers May Be Improved by Scientific Application of Model Test Data

By Alfred J. C. Robertson*

AT the November meetings of the Society of Naval Architects and Marine Engineers three scientific papers were read on Propellers and this is a fair indication that marine engineers and naval architects are coming to realize that the old methods of design are not sufficient to meet present conditions satisfactorily.

There is no doubt that the last few years have shown a notable improvement in the design of slow speed ships, which represent about 90 percent of vessels built, so that today designers are able to produce such ships with resistances of not more than say 10 percent above the minimum. Such results are largely due to increasing knowledge and understanding of model experiments, many of which, on low speed ships, have been made public in recent years.

On the other hand, it is not at all an unusual experience, when a change of propeller has been indicated, to find the speed of ship altered as much as a knot, representing perhaps 25 percent saving (or increase) in power.

CONDITIONS ALTERED BY USE OF GEARED TURBINES OR DIESEL ENGINES

The growing use of geared turbines or Diesel engines has at the same time largely discounted the value of accumulated propeller experience with reciprocating engines. These in most cases have been of the slow speed type permitting pitch ratios of 1.2, 1.3 and 1.4 whereas Diesel engines at present run at least 50 percent higher in revolutions for the same piston speed and machinery weight, giving pitch ratios of 0.80 to 0.95, with even higher relative speeds for single reduction geared turbines. For double reduction gearing lower speeds are available but the cost and weight of such gearing become almost prohibitive. In this case also, therefore, engineers are anxious to use propellers of the lower pitch ratios.

An additional incentive to the study of propeller design is provided in the case of Diesel engines because of the lack of elasticity of this type of prime mover. In reciprocating steam engines, if a propeller proves heavier in pitch or diameter than it should be, the revolutions of course drop, but it is usually possible to secure just as much power as was provided in the design by increasing the mean effective pressure in the cylinders.

In Diesel engines this advantage is denied us, because the design already makes use of the highest mean effective pressure which it is quite safe to use and any increase of that pressure is likely to produce troubles of various kinds through overheating, such as burning out valves and valve seats, cracking cylinder heads, etc.

EXPERIMENTAL TANK DATA NOT APPRECIATED BY PRACTICAL MEN

When therefore further knowledge of propellers is called for we naturally look to the work of the experimental tanks which have been of such assistance to us in the design of ships' hulls.

A considerable volume of such data has been available for some time but until recently it has been looked upon with grave suspicion by practical men; and this for three reasons: first, because practical men hardly understand or appreciate

the attitude of scientific men—that attitude which realizes and sometimes expresses a consciousness of vast realms of knowledge of which we have only touched the border, and secondly because propellers on ships will not give identical results with their models on model ships, and thirdly because of necessity model propeller data must be compiled independently of the ship with which it is desired to fit a propeller and the interaction between hull and propeller is still somewhat obscure.

But we are all becoming more scientific so that the first of these reasons should not deter us from the use of what knowledge exists and such knowledge will carry us along, perhaps not perfectly, but quite tolerably well, even if it be ultimately modified or displaced as they tell us Newton's most useful theory of gravitation has been displaced by more accurate knowledge.

MODEL TESTS DISPELLING DOUBT

The second reason is quickly vanishing as tests on full powered ships have been compared with the model tests and correction factors adduced, and the third reason will lose much of its force when we have before us such excellent papers as Professor Bragg's and Admiral Taylor's which deal very largely with the effect of a ship's hull upon the flow of water to the propeller.

Admiral Taylor's paper deals with tests made on one ship model with propellers of three different proportions and characteristics, located on a high and a low centerline, at three positions abaft the sternpost. In each case the model was driven by its own propeller at various speeds which practically covered the range of speeds at which a ship of the form of the model could be profitably operated. Careful records were taken and compared with the records made by the same propellers without the ship, i.e., in still water, and from these records the effect of the ship's wake upon the propeller, the suction or thrust deduction of the propeller upon the ship, and the hull efficiency resulting from these opposite forces, were arrived at.

Professor Bragg's paper records the results of many experiments to measure the speed of the water behind a ship where a propeller might be located.

ADVANCE OF PROPELLER MUST BE KNOWN

The significance of both of these investigations lies in the fact that the actual speed of a propeller through the water must be known, if the power it absorbs in torque or the power it delivers in thrust are to be known. Taylor's paper of course takes us further by giving us data as to whether the power delivered by the propeller (thrust) should or should not be equal to the resistance of the model as tested in the tank without the propeller (and usually designated E. H. P.).

As indicated, the speed of advance of propeller must be known. This is so because the slip of the propeller vitally affects its power to do work.

SLIP PERCENTAGE

Slip percentage is the ratio of the difference between the speed of advance of the propeller and its speed of advance as a screw through a solid. Without slip a propeller would

*Naval architect, Munson Steamship Line, New York.

advance the amount of its true pitch per revolution; if there is slip, the advance would be less.

The slip formula is therefore usually written

$$\frac{(N \times P) - (V_a \times 101.33)}{N \times P}$$

where N is the number of revolutions per minute, P is the pitch of propeller in feet and V_a is the speed of advance of the propeller in knots (i.e., speed of ship minus speed of wake water).

Nearly all propeller data is plotted upon this slip percentage, but this introduces us to one of the most difficult features in propeller analysis. Every propeller blade is possessed of a certain thickness and, if the face of the blade conforms to a true screw of uniform pitch, it will be found that the true pitch of the propeller, that is, the pitch at which the screw delivers no thrust, is somewhat greater than the face pitch, and the true slip for comparative purposes must be expressed as a function of this true pitch.

TAYLOR'S AND FROUDE'S PROPELLER DATA

In addition to the very extensive experiments on propellers carried out and made public by Admiral Taylor, Mr. R. E. Froude of England has also given us a somewhat similar series and all of Froude's propeller data is based on this true pitch of propeller. This has made it possible to express the results of the Froude propeller tests in a mathematical formula whereas Taylor's tests are simply presented as curves of performance plotted on face slip.

Each method has its own value. Taylor's method is probably more accurate for propellers similar to those tested, whereas Froude's propellers, being correlated by formula, are probably better for interpolation or extrapolation. Mr. T. B. Abell very carefully analyzed both sets of data and showed that substantially the results were the same though the general conditions of test as to size, design, location of propeller, etc., were different, and the method of tabulation differed fundamentally as stated.

In 1915 Schaffran in Germany proposed a method of setting forth the performance of individual model propellers in a manner readily applicable to full size screws.

SCHAFFRAN'S METHOD

This method is apparently becoming a popular one and Taylor has used it in his most recent contribution for furnishing us with the still water performance data of the three screws used.

Schaffran's data uses face slip ratio as abscissæ and curves of coefficients of torque and thrust and the resulting efficiency curve are plotted thereon. Writing

Q = Torque in foot pounds.

T = Thrust in pounds.

N = Revolutions per second.

V = Speed of advance in feet per second.

P = Face pitch in feet.

D = Propeller diameter, in feet.

We have

$$C_Q = \frac{Q}{N^2 P^3 D^2}$$

$$C_T = \frac{T}{N^2 P^2 D^2}$$

$$e = \frac{T \times V}{2 \pi Q N}$$

For ready application we may add

$$\text{Torque Horsepower Q. H. P.} = \frac{C_Q N^3 P^3 D^2}{87.535}$$

$$\text{and Thrust Horsepower, T. H. P.} = \frac{C_T N^2 P^2 D^2 V}{550}$$

Or more conveniently for ship problems we may use Froude's symbols:

$$R = \frac{\text{Revolutions per minute}}{100}$$

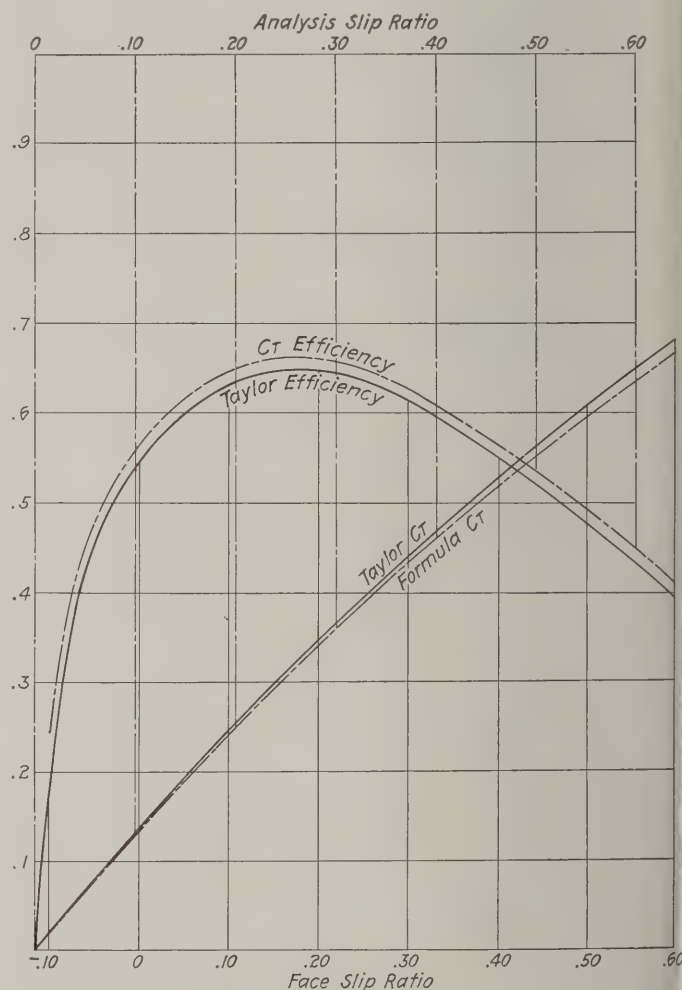
V_a = Speed of advance in knots

$$\text{Then Torque Horsepower, Q. H. P.} = \frac{R^3 P^3 D^2 C_Q}{18.908}$$

$$\text{Thrust Horsepower, T. H. P.} = \frac{R^2 P^2 D^2 V_a C_T}{117.24}$$

$$e = \frac{C_T}{C_Q} \times \frac{0.16127 V_a}{R. P.}$$

With a Schaffran diagram for a particular propeller it is very simple from trial trip results to calculate the wake



Taylor's Propeller No. 571

fraction and hull efficiency value and from these also the thrust deduction, and these elements will then be known for any new propeller for the same or a similar ship.

Taylor's paper shows that so long as the propeller is sufficiently far behind the stern post to avoid the erratic flow of the water there is no material difference in the above factors for considerable variation of diameter and pitch ratio of the screw, so that once the wake and thrust deduction are ascertained for a particular ship these may quite safely be assumed to be constant at the same ship's speed, and that at other speeds the variations are insignificant.

For vessels of other forms than that tested the paper by Professor Bragg may be referred to, and also papers by McEntee presented to the Society of Naval Architects and Marine Engineers in 1918 and 1919. From these it is pos-

sible to plot curves of wake and thrust deduction on the vertical or longitudinal prismatic coefficients.

HOLT'S THRUST MEASUREMENTS

Mr. C. F. Holt in 1920 contributed a valuable paper to the Institution of Naval Architects (London) which gave results of actual thrust measurements made on trials of several ships, and from these he deduced that the thrust developed at sea was about 7½ percent less than the model test results for a similar propeller whereas the torque was about 7½ percent higher, giving efficiencies of about 85 percent of the model efficiencies. These figures are probably somewhat pessimistic but in the absence of other data they should be accepted and applied in the analysis of trial trip results. This would mean that CQ should be increased 7½ percent and Cr reduced by the same amount when using propeller data with the Schaffran constants.

An example of the analysis of trial trip results is given in an appendix to this article. To utilize propeller data in the Schaffran form for design purposes it is necessary to adopt the method of trial and error. Assuming the pitch ratio, revolutions and horsepower are fixed it is required to ascertain the diameter and pitch. CQ or Cr are of course dependent upon slip and this also is unknown until pitch is known or assumed.

$$(1 - S) = \frac{V_a \times 1.013}{R \times P}, \text{ therefore } P = \frac{V_a \times 1.013}{R \times (1 - S)}$$

Then assuming say three values of slip the corresponding values of pitch are calculated and, pitch ratios being fixed, the diameters are ascertained and the horsepower may then be computed for the assumed propellers.

Curves of pitches and diameters will then be laid off on horsepower, and the required dimensions read off for the requisite power.

APPENDIX

Trial Trip Analysis

Example: Using Holt's factors for T.H.P. = 0.925 model T.H.P.
Model Q.H.P.
Q.H.P. = 0.925

Taylor's Propeller No. 571. (See Fig. 6, page 787, MARINE ENGINEERING AND SHIPPING AGE, December, 1922.) Diameter, 11 feet 9 inches; pitch, 8.45 feet; R.P.M., 125; S.H.P., 875; ship speed, 10.0; E.H.P., 438.

$$Q.H.P. = 875 \times 0.97 = 849 \text{ say } \frac{R^3 P^3 D^2 C_Q}{18.908 \times .925}$$

$$C_Q = \frac{Q.H.P. \times 18.908 \times .925}{1.952 \times 138 \times 603} = \frac{14,849}{162,434} = 0.0914$$

Face slip from diagram = 0.41

$$1 - S = 0.59, V_a = \frac{.59 \times 1.25 \times 8.45}{1.0133} = 6.15 \text{ knots}$$

$$\text{Wake} = \frac{10 - 6.15}{10} = 0.385$$

$$\text{Thrust H.P.} = \frac{C_r R^2 P^2 D^5 V_a \times 0.925}{117.24} = \frac{0.53 \times 0.925}{117.24} \times R^2 P^2 D^5$$

< 6.15 = 396

$$\text{Hull efficiency} = \frac{E.H.P.}{T.H.P.} = \frac{438}{396} = 1.106$$

$$\text{Thrust deduction } \therefore (1 - t) = (1 - w) \times 1.106 = 0.68, t = 0.32$$

$$\text{Propeller efficiency} = \frac{438}{849} = 0.466 \text{ (from diagram } 0.548 \times 0.85 = 0.466)$$

$$\text{Propulsive coefficient} = \frac{438}{875} = 0.500 \text{ using S.H.P. (= 0.466 on H.P.)}$$

The Wake System of Automatic Steering

By R. H. Rogers*

SHIP and its cargo weighing twenty thousand tons and moving twenty feet per second is reluctant to change its direction of motion, but is singularly free to yaw to port and starboard of the course being made good, as indicated by the wake. The sweep effect of the rudder is negligible hence the power to change a ship's heading, which is one thing, and to change her course, which is another, does not come from the rudder motive power, but from the stored energy of the moving mass and that necessarily at a sacrifice of its velocity.

The compass is a little slow in its warning and the helm is moved too late, too much and too often, with the result that a ship's daily run is the average of an undulating speed curve which has a dip for every helm movement. The General Electric Company has made observations and records for several years on many ships which reveal preventable losses of considerable magnitude as compared with other shipboard losses that are receiving much more attention.

The frequency and amplitude of yawing in a well trimmed ship of 12,000 tons displacement making 12½ knots in fair

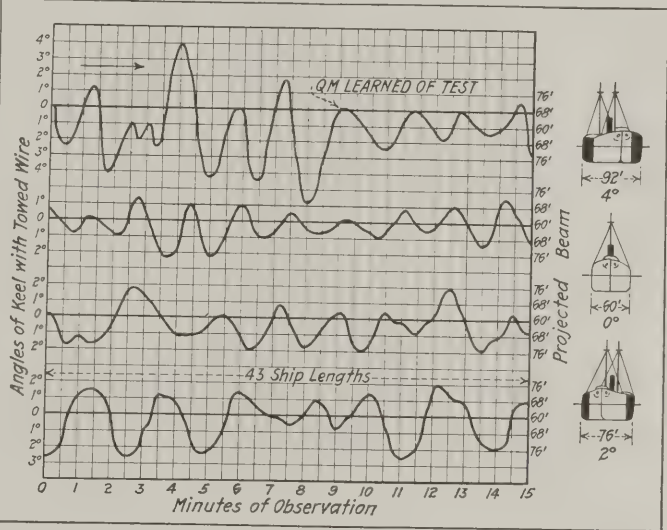


Fig. 1.—Typical Yawing Chart Made by Hand Steering

sea and weather is shown in Fig. 1. This record was on a 300 degree course steered by hand to a gyro compass through a hydraulic telemotor and an electric steering gear, all in good condition. There were 67 reversals of headings in one hour. A yawing of 6 degrees in one half minute was noted. The ship yawed 4 degrees while going one length.

To mitigate the variable losses of time and fuel and to hold the ship closely to the desired course, are the functions of automatic steering devices which must kill incipient swings before they have grown appreciably.

OPERATING PRINCIPLES OF WAKE SYSTEM

The wake system of automatic steering functions to fix the course made good, leaving the ship's heading free to prevent deviations that might be caused by wind, seas or propeller drift. The actuating member is a taut wire line from the ship to a suitable drag, towed in the wake and which is therefore exactly in line with the course being made good. The ship pivots about the inboard end of the wire, pressing one or the other of two electric switches against it. These switches control an electric telemotor which works parallel to the

*Marine Department, General Electric Company, Schenectady, N. Y.

normal telemotor and controls the steering gear to give prompt and proportional countering helms which die out to zero as the error dies out.

The point of attachment for the wire has a small athwart-ship movement imparted by a mechanical connection to the rudder stock. This movement serves to allow the ship to take any heading necessary to free the switches from the wire, thus holding the direction of motion to a definite line. This lateral motion is too small to affect the direction of the long wire but it has a marked effect in the short distance

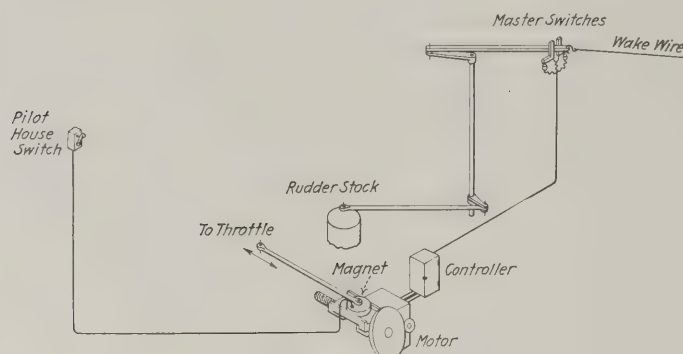


Fig. 2.—Diagram of Wake System Controls

to the switches where 1 degree of swing causes $\frac{1}{2}$ inch of relative movement.

Fig. 2 shows a schematic diagram of an application to a ship. It has been demonstrated that 145 fathoms of sounding wire towing a 30 pound sounding lead makes a satisfactory combination. The tension is 150 pounds at $12\frac{1}{2}$ knots, giving great rigidity against the side pressure of the switches. Rolling and pitching produce no detrimental relative movement between the wire and switches which may be adjusted for a reasonable tolerance. Fig. 2 shows the ship under very variable conditions following its predetermined course with free headings.

The practical operation of the wake automatic steerer is very simple and easily understood. The quartermaster will steer by hand on whatever heading is necessary to make good the desired course, the lee-way, if any, being indicated in

degrees at the wire. When satisfied with the course, the pilot house switch is closed, thereby putting the automatic in charge. The ship will now progress in a straight line but with variable headings if the deflecting influences are variable and the navigator is no longer required to estimate corrections for drift, etc. After a time, an appreciable error may be built up which may be corrected by opening the pilot house switch to allow of hand steering again for a few moments.

The guiding principle of the towed line is very marked, its indications being instantaneous and exact, being in advance of and in excess of those shown by the compass.

BRITISH TANKER DELIVERED.—The *British Fusilier*, which has been built and engined by Swan, Hunter & Wigham Richardson, Ltd., at their Neptune Works, Newcastle-on-Tyne, to the order of the British Tanker Company, Ltd., of London, has completed a very successful trial trip off the Tyne, and sailed to take up her station on her owners' service. The steamer is an oil tanker, carrying over 10,000 tons of oil, and is about 455 feet in length by 57 feet beam. The propelling machinery has also been constructed by Swan, Hunter & Wigham Richardson, Ltd., at their Neptune Engine Works, Newcastle-on-Tyne, and consists of a set of turbines of the Metropolitan-Vickers Rateau type, with double reduction gearing of the three-box floating frame type, steam being supplied by three large boilers fitted with Howden's system of forced draft, and burning oil fuel on the Wallsend-Howden system. The principal engine room auxiliaries are electrically driven. On the trials a speed of $11\frac{3}{4}$ knots was attained.

CABLE STEAMER DICKENSON LAUNCHED.—The cable supply steamer *Dickenson*, described on page 92 of our February issue, was successfully launched on February 17, at the yard of the Sun Shipbuilding Company, Chester, Pa., the sponsor being Miss Mary Dickenson, daughter of one of the former officials of the Commercial Pacific Cable Company, for whom this vessel is being built. The *Dickenson* was designed by Messrs. Cox & Stevens, who also superintended her construction, and as soon as she is completed will proceed to the Pacific Coast and take up her station at Midway Island, which will be her headquarters.

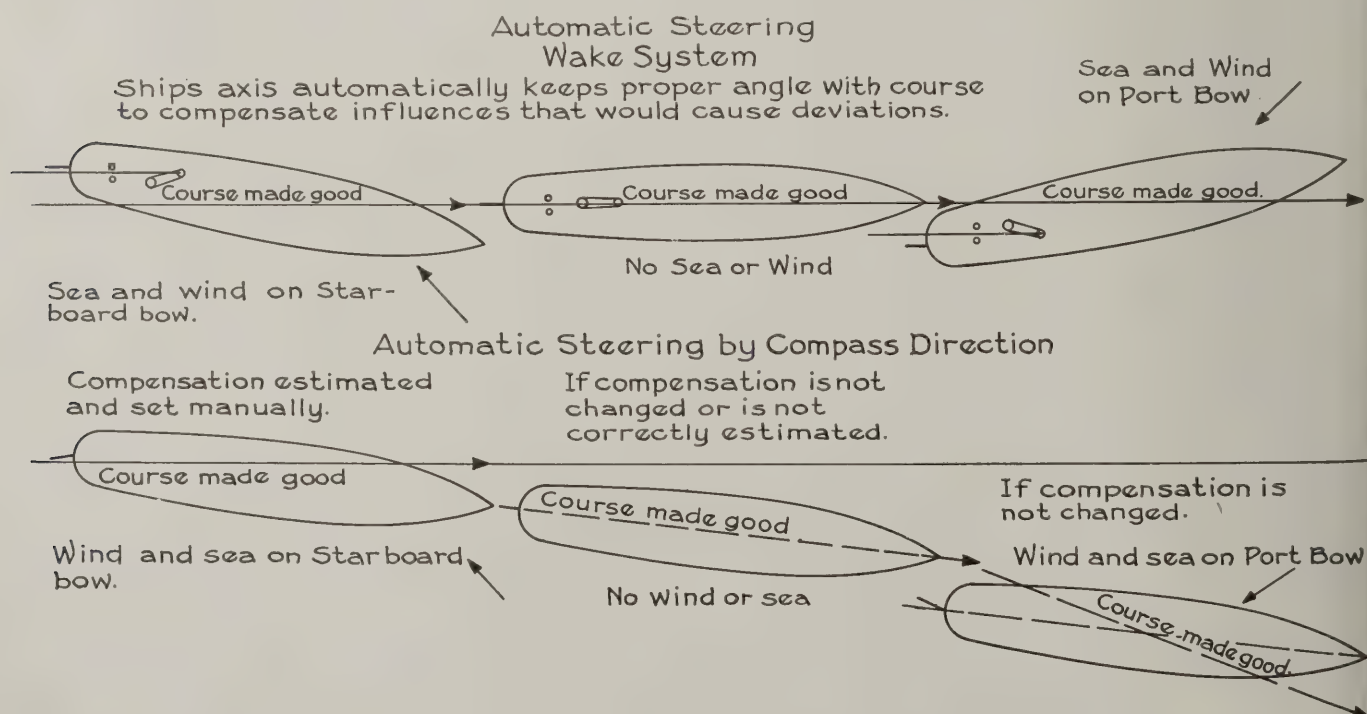


Fig. 3.—Comparison of Wake System of Steering and Automatic Steering by Compass Direction

Wood Preservatives For Shipbuilding Purposes

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials' point of view.

THIS article has to do with materials used during the construction of wooden vessels in order to guard against decay. The nature of this decay and the importance of guarding against it have been dealt with in the article by the writer on "Timbers and Lumber," in the September, 1921, issue of this magazine. The use of wood preservatives for the prevention of teredo attack will be considered under the heading of Protective Coatings for that purpose.

Good ventilation is one of the best safeguards against decay and provisions for it called for by the best practice are well worth while. On the other hand, the painting of inside surfaces of wood hulls, which is sometimes called for, retards the drying out of the wood and encourages decay.

SALT AND CREOSOTE

Probably the oldest preservative in use, and certainly the one in almost exclusive use up to comparatively recent years, is common salt. The salting of a vessel is done after the timbers to be preserved are in place in the vessel. Inaccessible spaces whose surfaces are particularly subject to decay are packed with salt, and this in most locations necessitates the fitting of boards, called salt stops, between the timbers to keep the salt in place. The salt when kept wet forms a preservative brine.

The only rival of salting whose value has been proved to date is coal-tar creosote, and this product either under its own name or some proprietary name has been extensively used during recent years. The nature of this material and its method of application may be understood from the following specifications which were adopted by the United States Shipping Board Emergency Fleet Corporation, which made this preservative the standard for its entire fleet of wood steamships and schooner barges. The specifications for the creosote oil itself were prepared by the Forest Service of the United States Department of Agriculture, which has done a great amount of research and other work on this subject. The high boiling point oil is specified to minimize the loss due to evaporation of the oil.

CREOSOTE OIL FOR BRUSH TREATING OF SHIP TIMBERS

1. The oil to be obtained from coal gas or coke-oven tar and shall be free from any tar, including coal gas tar and coke-oven tar, oil or residue obtained from petroleum or any other source. Oil to comply with the following requirements:

1. To be completely liquid at 15 degrees C.
2. To contain not more than 2 percent of water.
3. To contain not more than 0.5 percent of matter insoluble in benzol.
4. The specific gravity of the oil at 15 degrees/15.5 degrees C. shall not be less than 1.08.
5. The distillate based on water-free oil to be within the following limits:
Up to 210 degrees C. not more than 1 percent.
Up to 235 degrees C. not more than 10 percent.

6. The specific gravity of the fraction between 235 degrees C. and 315 degrees C. to be not less than 1.03 at 38 degrees/15.5 degrees C. The specific gravity of the fraction between 315 de-

grees C. and 355 degrees C shall not be less than 1.10 at 38 degrees/15.5 degrees C.

7. The residue above 355 degrees, if it exceeds 5 percent, shall have a float-test of not more than 50 seconds at 70 degrees C.

8. The oil to yield not more than 2 percent coke residue.

9. The foregoing tests shall be made in accordance with the standard methods of the American Wood Preservers' Association.

2. Although the brush treatment is less efficient than the pressure or open tank system, it is recognized as often desirable and is used by many in the absence of more thorough methods. Unless absolutely unavoidable the timber should not be treated when it is green, wet or frozen. It should be borne in mind that by not properly carrying out the brush treatment it is an easy matter to render the treatment worthless.

3. Coal-tar creosote oil should be applied with a three or four knot rubber set or wire bound roofing brush, the oil having been heated to a temperature of 200 degrees Fahrenheit. All crevices and shakes should be filled with the oil, using the same liberally for the first coat. The second coat should not be applied until the preceding coat has been fully absorbed. It is best to apply the different coats on different days.

4. During the building of hulls all faying or joined surfaces of timbers and planks, etc., throughout will receive two coats of preservative.

In a consideration of the relative merits of the salting and creosoting methods, it can be said for salting that it is inexpensive, easy to apply regardless of temperature and weather conditions, and comparatively easy to keep in condition or renew. Its chief objection is its weight and the loss of dead-weight carrying capacity thereby incurred. As its poisoning property is very low it must be used freely. It was estimated that one of the Emergency Fleet Corporation standard wood steamships would require about 90 tons of salt, if this method should be adopted. Salting also interferes with ventilation which particularly affects the spaces below the salt chocks, and it subjects iron fastenings, even when galvanized, to rapid corrosion.

The Forest Service has stated that coal-tar creosote is probably the most effective preservative which can be readily applied on ships at the time they are under construction. It has been thoroughly tried out and found to accomplish the desired results. There are proprietary preservatives made from wood tar and water gas tar which may be effective, but the writer does not know that any of them have been thoroughly proved. They have not to date been looked upon with favor by the classification societies. It is, however, claimed by one of the manufacturers of wood-tar creosote that such a creosote is much superior to the coal-tar creosote in locations where the wood is continually wet. Creosote is more difficult to apply properly, and this difficulty assumes importance when the timbers are green, wet or frozen; and the checking up of its proper application is more difficult. Workmen, except negroes, are subject to burns from it, particularly those with light complexions; but this can be guarded against by the use of vaseline. Oil paint cannot be successfully applied to creosoted surfaces and the creosote has a tendency to disintegrate oakum. It is claimed by some

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

that the odors given off by creosote damage such cargoes as flour and rice, but the amount called for to meet classification society requirements is not sufficient to cause material damage of this nature.

The classification societies strongly recommend the use of a preservative during the construction of a wood vessel and the application of a preservative according to their requirements entitles the vessel to a longer classed life. Their requirements when salting is used are pretty definitely defined in their published rules for wood ship construction; but these rules do not cover the creosoting method and in some cases a classification society may require salting in whole or in part. As has been pointed out in the article on "Timbers and Lumber" before referred to, the hardwoods contain considerably more moisture than softwoods and therefore require a longer time to season. In vessels with oak framing the timbers might be far from being seasoned when in place in the vessel, whereas the framing, if of yellow pine or Douglas fir, would in the same length of time be well seasoned. For this reason one or more of the classification societies have in some cases required salting with hardwood framing.

DETAILS OF APPLICATION

The Forest Service has presented the following old classification society rules, somewhat modified, as representative of thorough treatment when the salting preservative method is adopted:

The stops between the frames to be placed at the light waterline, and the spaces between the frames filled with salt to the planksheer. If the frame timbers are choked apart, the chocks are to be partially split out next the ceiling, and the salt admitted to stops between the timbers of each frame, at the height of the light waterline, fore and aft, and the spaces filled with salt to the gunwale. The salt between the frames should be dampened down at intervals to renew the pickle.

The stern frame, and the cant frames, forward and aft, to be salted in the same manner down to the deadwoods and as many more frames as the cants, at each end, to be salted down to the short floor-heads, stops being put in at intervals of about three feet each. The spaces over the shelf or knees to be filled with salt, at least one inch deep. Stops to be fitted to keep the salt from choking the air and water courses, wherever these interfere with continuous filling.

After the ceiling is worked, holes of the size of treenails, to be bored in the middle of the strakes, and alternately into each timber of the frame nearly to the planking, and filled with salt, wetted with pickle and plugged. Where holes are bored for through treenails, if plugs are inserted to hold the brine, the frame may be salted and pickled thoroughly, before the fastening is all driven.

The ends of beams, arms of knees, hooks, transoms, stern-post, apron, and stem, the deadwoods and keelsons to be internally salted, in the same way. Holes to be also bored through the rail into the stanchion heads, the knightheads, head of pall-post, rudder-stock, bowsprit and masts, and the overhead arches of steam vessels for the reception of salt and brine, and be plugged for convenient renewal annually. The keelson to be cased fore and aft, where single, with room of one inch on top and sides for the reception of salt. If the keelsons are double, the space between to be ceiled and calked, and the salt put between them and covered.

The deck framing to be grooved along the grain, in the middle of the beams, ledges, carlins and partners, to the depth of an inch, and the grooves filled with salt as the deck is laid. The deck to be bored over the middle of the beams and ledges, in the middle of alternate strakes, salted and brined to the depth of six inches, and the holes tightly plugged one inch deep. The planksheer to be bored over the salt spaces for renewing the salt between the timbers. All salt plugs to be removable, that the salting may be renewed annually, until no longer necessary for the preservation of the wood.

As a guide to what may be called for when creosoting is adopted, the requirements of the American Bureau of Shipping issued in 1917 for the wood ships of the Emergency Fleet Corporation are of value. They called for two coats of preservative on the surfaces of all important structural members in contact with other surfaces, but not including calking seams or butts, and on all surfaces of beam ends for 4 feet 6 inches in from the ends, and three coats of preservative on all surfaces of beams in coal bunkers. Oak

treenails were required to be immersed in preservative heated to 180 degrees for at least ten minutes. Iron fastenings and spikes might be dipped in cold preservative, in lieu of grease, before driving, except where driven from surfaces which were later to receive lead and oil paint.

The coating of butts except in way of calking is particularly important, as decay is likely to begin at the butts. It is desirable to coat the exposed surfaces of all frame timbers as well as the faying surfaces; and also the frame side of the planking and ceiling. Other important surfaces are the tops of weather deck beams, contact surfaces of shelves, clamps and waterways, all contact surfaces of bulkheads and all parts of the deadwoods.

In order to be effective, the preservative should thoroughly impregnate the wood to a depth sufficient to allow for subsequent season checking, mechanical abrasion, injuries, etc. Creosoting by the pressure method is of course the best method, but this is usually not practicable for shipbuilding work. The next best method is dipping. A liberal application of hot creosote with an air spray or brush comes next in order to dipping, the air spray being probably the better of the two. With brush treatment the creosote should be flowed on, using a large brush, and not be handled like a paint. It is of little value to creosote timber before it is cut to size and shape because the subsequent cutting operations will even with the most thoroughly impregnated treatment penetrate the treatment and permit decay to start on the untreated wood thus exposed.

Creosote is much more effective when applied hot and the heating of it can be readily accomplished by the use of steam without fire risk or appreciable additional labor cost. A method of heating the creosote adopted by one shipyard was observed and reported upon by the Forest Service as follows:

A box about 2 feet wide and 10 feet long is made watertight by calking. The top is made with round holes cut into it, of the right size to receive a cone-shaped bucket. The lower part of the bucket sinks into the water, the top rim sitting over the hole, which holds the bucket in place. The box is filled with water which is heated to the boiling point by steam from a steam pipe at one end. This could also be accomplished by a steam coil, thereby saving the steam, or by a pipe running the full length of the box with jets at various intervals. Where possible, exhaust steam should be used. The wood preservative is placed in the cone-shaped buckets which, when set in the holes of the box, are immersed in the boiling water. The preservative soon heats to approximately the boiling point of water and is taken in the buckets directly to the ships, to be applied on the timbers. Before this method was in use four men in different parts of the yard at wages of 40 cents an hour were employed to heat this preservative. With this method no extra men are necessary as the men applying the preservative, on returning to the box simply refill their empty buckets, place them in the hot water, and take one filled with hot preservative. When not in use the buckets should be covered. The preservative thus is heating while the men are applying it on the ship timbers. In this manner a saving of about \$17 a day was accomplished, beside keeping the preservative at a high temperature continuously, with no risk of fire.

OTHER PRESERVATIVES

Brazilians are said to use a preservative called "Gallagalla," composed of pitch, unslacked lime and oil, mixed to a rather stiff consistency and applied without heating. A process for treating the wood with a solution of hot ferrous sulphate followed by a solution of copper sulphate was investigated by the Forest Service, and an adverse report submitted by them. There is a poisoned paraffine process which is claimed by its inventor to provide efficient protection at a cost only slightly in excess of creosoting. There are also other processes proposed from time to time for the preservation of ship timbers from decay, but they are generally too expensive or are impracticable under shipbuilding conditions.

THE NATIONAL SAFETY COUNCIL has accepted the invitation of the Buffalo Chamber of Commerce to hold the 1923 National Safety Congress at the Statler Hotel, Buffalo, N. Y., October 1 to 5.

Waves of the Ocean

Theory of Waves—Speed, Length and Height — Surface Tension

By C. H. Peabody, Dr. Eng.

IT is astonishing how little is known about the waves of the ocean considering that they have been known to navigators for thousands of years, more especially as the commonly accepted theory was developed by Gerstner more than a 100 years ago. To be sure the true ocean wave is found only in the open sea and scientists habitually live ashore; few seamen are scientists and those who are have something else to do than making investigations of the shifting and evanescent waves; and wave measurements are difficult and uncertain.

TROCHOIDAL THEORY OF WAVES

The commonly accepted theory is known as the trochoidal theory, which has the advantage that it gives fairly simple methods of calculating the properties of waves and ties in fairly well with the measurements of waves that have been made, namely of length and speed. As for the somewhat formidable name of the theory it may be sufficient to say that the trochoid is the path of a spot on a wheel as it rolls

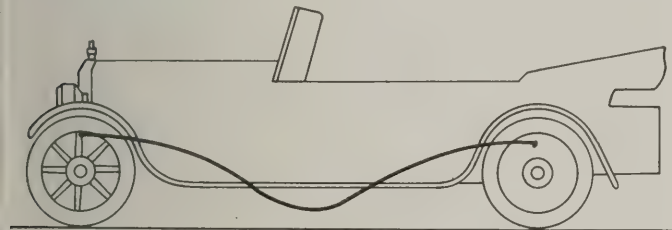


Fig. 1

along, as illustrated in Fig. 1; such a trochoid is upside down when compared with that of the wave but that need not concern us now.

If you watch a wave at sea you will see it approach the ship, under-run it and speed away in the distance; but if you watch something afloat, perhaps a bit of seaweed, you will see it move up and down with the wave but you will see that it does not move forward with the wave. A close inspection shows that it moves back and forth as well as up and down. Usually there is a slow drift in the direction of the motion of the wave, but some time is required to detect it and one is likely to assume that it is blown along by the wind; and so it undoubtedly is though there is reason to think there is a proper drift.

TROCHOIDAL MOTION

Starting with the idea that a particle of water affected by a wave moves up and down and back and forth, the easiest conception of such a motion is that the particle of water revolves round in a circle about a fixed center. That is the

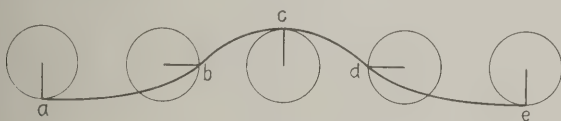


Fig. 2

fundamental idea of trochoidal motion. Thus in Fig. 2 let $a b c d e$ be particles of water uniformly spaced; let c be at the crest of the wave and let a and e be at hollows, while b and d are on the slopes; a curve drawn through these points is a trochoid like that of Fig. 1 except that it is the other side up.

The real reason why the trochoid was shown by Gerstner for his wave theory, is that it is relatively easy mathematically; when he found that with the theory he could compute the properties of the waves and that his computations tied in with what was known or could really be determined about waves, he must have been convinced that he had found the true key to the problem.

But it is easy to show that the sea wave does not have the



Fig. 3

form of a trochoid because the mathematical limit of that wave is found when the trochoid of Fig. 1 is made by a point on the extreme outside of the tire. Thus in Fig. 3 when the radius of the orbit of a particle of water is taken as

6.283

of the length we have a cycloid. The trochoidal theory shows that a particle of water might revolve in such orbits as shown in Fig. 3 and that at the crest the pull of gravity would be just sufficient to keep the particle in its orbit and no more. Should the height of the wave increase ever so little the particle at the crest would fly off and the wave would break. But the most casual observation of waves at sea shows that they break at the crest long before they become so high. The cycloidal wave, should one exist, would have a height from hollow to crest of nearly a third of the length, whereas sea waves break when the height is a fifth of the length or less.

REQUIREMENTS FOR FORMATION OF SEA WAVE

Now mathematicians have decided that while a trochoidal wave could exist, if once made, such a wave never has been or can be formed at sea. There are three things necessary for the formation of a sea wave, namely, equilibrium, continuity and irrotation. This looks like a formidable list of requirements and the equations expressing them are even more formidable to the dabbler in mathematics who knows about enough to integrate for the area of a simple figure. But the fundamental ideas can be stated simply enough.

For the trochoidal theory we have assumed that each particle of water revolves uniformly in a circular orbit; the forces acting on it are in equilibrium as are those acting on a planet; the earth swings round securely forever in its orbit. A similar, though perhaps a more complicated, condition is required for any wave motion.

The condition of continuity is almost ridiculous in its simplicity; there must not be any holes in the water; a lot of bubbles for example.

The third condition requires a little more explanation. Consider the crank of an automobile; if the handle is a solid piece of steel it will turn in the hand, and the motion of the handle in its orbit will be rotational; but if there is a loose wooden handle it will not turn in the hand, and the same side will always be on the top, and so its motion is irrotational. The only test for rotation of the water in a trochoidal wave is that the equations for the wave do not conform to the tests applied by the mathematician; as

we are not going to develop those equations nor explain the test we will have to let it go at that. But this we will say that the only forces acting on the water in a wave are pressure and gravity, and the mathematician readily shows that those forces cannot produce rotation. If, then, there can be no rotation to a sea wave, the trochoidal wave with rotation is not the true sea wave. Q.E.D.

There are one or two little matters which have been left out all along, like viscosity of the water and surface tension or, as it is sometimes called, capillarity. It is easy to show mathematically that these influences have no appreciable effect on sea waves which commonly are three hundred feet long and sometimes are a thousand feet long.

IRROTATIONAL WAVE THEORY

By the application of the methods of hydrodynamics, Sir G. Stokes has developed the theory of an irrotational wave which has two items of interest for us; one is that the form of the wave at the limit when the crest begins to break is reasonably like that of the great sea combers; the other one is that his theory gives forms for long gentle swells that approach near to those of the trochoidal wave. The last item is very important for it indicates that for waves that



Fig. 4

do not approach the limit of breaking, we may use the methods of computation developed for the trochoidal wave.

The form of Stokes' wave at the limit is shown by Fig. 4, taken from the writer's "Naval Architecture;" so far as is known that is the only correct representation of Stokes' wave extant. The most notable thing about the contour of the wave as shown in Fig. 4 is the roof shape of the crest; the angle at the peak is 120 degrees and that is shown by Stokes to be a necessary condition for an irrotational wave. Even casual observation of sea waves which have a tendency to break at the crest will show that they have this characteristic.

It has already been said that a rotational wave like the trochoidal wave (which conforms by the way to the requirements of equilibrium and continuity) is discarded by the mathematicians because there is no natural cause to make rotation. Curiously enough attempts to make artificial trochoidal waves do not come out any better. When R. E. Froude wanted a trochoidal wave in the Admiralty experimental tank and set up a proper apparatus for that purpose, he did not get it, but got a wave similar to the Stokes wave as he kindly showed the writer when he visited that tank.

One more feature of the Stokes' wave will be mentioned and then we will drop it as it is not conveniently computed for ordinary use; this feature is that his wave is shown mathematically to have a slow drift of the water in the direction in which the wave runs. Another mathematical form possible for irrotational waves is proposed by Michell; its notable feature is that the theory shows that the crest will break when the height is one-seventh of the length. It also approaches the form of the trochoidal wave when the height is small.

RELATION OF SPEED AND LENGTH

The most interesting property that can be computed by aid of the trochoidal theory is the relation of speed and length; without going into details of the theory or its application for this purpose we will give the results in the following table:

Length, Time and Speed of Waves

Length, feet	Time, seconds	Speed, feet per second	Speed in knots
50	3.10	16.0	9.5
100	4.40	22.7	13.4
200	6.20	32.0	19.0
400	8.80	45.3	26.8
600	10.80	55.0	32.8
800	12.50	64.1	37.9
1,000	14.00	71.6	42.4
2,000	19.8	101.5	60.0

It may be interesting to note that the open ocean wave is about 400 feet long and has a speed of 26.8 knots, a speed attained by a few classes of ships such as express passenger steamers, battle cruisers and destroyers; a thousand-foot wave has the speed of an express train and a 2,000-foot wave is twice as fast as anything that floats.

The measurements of the time and length of waves can be made without special apparatus and require but little practice; unfortunately conditions for good results are likely to interfere with the proper navigation of the ship, which is the reason such measurements are so seldom undertaken.

HOW TO MEASURE LENGTH AND TIME OF WAVES

When a ship is steaming directly across the waves, a life buoy may be run out on a log line, which has marks at every 50.7 feet. By trial the length of the line may be adjusted so that the buoy shall be on the crest of a wave astern at the time when there is a crest directly under the observer.

For measuring time it is most convenient to stop the engine and wait till the ship has lost way, and then note the time between successive crests. If, however, it is desired to take observations while the ship is steaming slowly against the waves an allowance must be made for the speed of the ship. Suppose that the ship is steaming ten knots an hour, then since there are 6,080 feet in a knot the speed in feet per second will be:

$$10(6,080 \div 3,600) = 10 \times 1.69 = 16.9 \text{ feet per second.}$$

If the observed time from one wave to the next wave is 6.4 seconds the ship will have run forward

$$6.4 \times 16.9 = 108 \text{ feet}$$

during the time of the observation. If the observed length of the wave is 400 feet it is clear that the crest will have run only

$$400 - 108 = 292 \text{ feet.}$$

Consequently a simple proportion will give for the time required to run 400 feet

$$292:400 :: 6.4:t_w, \text{ therefore } t_w = 8.8 \text{ seconds.}$$

HEIGHT OF WAVES

There is nothing more illusive than the apparent height of waves, especially when the ship is rolling and the waves are high and threatening. No apparatus is necessary and there is no need to change the course or speed of the ship; all deck officers are advised to acquire some facility in estimating wave heights. The observer must find by trial some position at a proper height, such that he can just see the horizon over the crest of the nearest wave when the ship is erect in a hollow. The distance from his eye to the water is the height of the wave from hollow to crest. Patience and adroitness will be required by the observer to get a combination of the conditions so briefly stated above; and it may be difficult to find a proper location on ships with lofty decks now in common service. Wave heights are seldom more than five percent of the length; so that a 400 foot wave would be 20 feet high.

EFFECT OF DEPTH OF WATER ON WAVES

Any acceptable wave theory must indicate that the wave disturbance dies out downward and agree with the observa-

tion that there is little or no disturbance in deep water. The trochoidal theory gives the following table:

Decrease of Wave Disturbance with Depth	
Ratio of depth to length	Ratio of orbits of particles
0.01	0.94
0.02	0.88
0.03	0.83
0.04	0.78
0.05	0.73
0.1	0.53
0.2	0.28
0.3	0.15
0.5	0.043
1.0	0.0019
2.0	0.000035

It will be noted that at a depth equal to one-tenth of the length the disturbance is only half that at the surface; a 400-foot wave may have a height of 20 feet at the surface but at a depth of 40 feet below the surface the disturbance is only 10 feet. At a depth equal to half the wave length the disturbance is reduced to four percent that at the surface. Our 400-foot wave with a height of 20 feet will have a disturbance of only five inches at a depth of 200 feet. This is the rational of the rule that the depth of water proper for speed trials of a ship is half the corresponding wave length. Thus a ship with a speed of 26.8 knots will be accompanied by waves 400 feet long and should not be tried in less than 200 feet of water. More extended observations of speed trial conditions show that this rule is likely to give greater depth than necessary for fast ships like torpedo boats and destroyers and not enough for large ships with deep draft.

ENERGY IN WAVES

Viewing waves either from the shore or from the deck of a ship at sea one is impressed by the limitless store of energy running to waste. The theory of trochoidal waves gives a simple approximate equation for energy

$$E = \frac{1}{8} w L h^2$$

where w is the weight of a cubic foot of water (64 pounds for sea water) L is the length from crest to crest in feet and h is the height of the wave also in feet; this gives the energy of a strip of water one foot wide and L feet long; the depth is not limited but it has already been shown that a wave dies out rapidly downward so that the energy is relatively near the surface, say half a wave length deep. For a wave 400 feet long and 20 feet high the equation gives

$$E = \frac{1}{8} \times 64 \times 400 \times 20^2 = 1,280,000 \text{ foot pounds.}$$

Were there any way of harvesting the energy of the sea there would be no occasion to worry over coal supply. But at present there seems better prospect of harvesting the sunbeams of the desert of Sahara.

EFFECT OF SURFACE TENSION

So far we have been dealing with large waves which are not affected by surface tension or capillarity. Our present interest is that surface tension interferes if we try to make observations on small waves either in the laboratory or on open water, observations which are attractive and relatively easy but which give incorrect impressions, if our results are applied to large waves. If the waves are small enough their characteristics are controlled entirely by surface tension, gravity having no appreciable effect. To show that the characteristics are different from those of large waves it is enough to say that the shorter such waves are the faster they go. This is exhibited in the following table which is in inches and seconds.

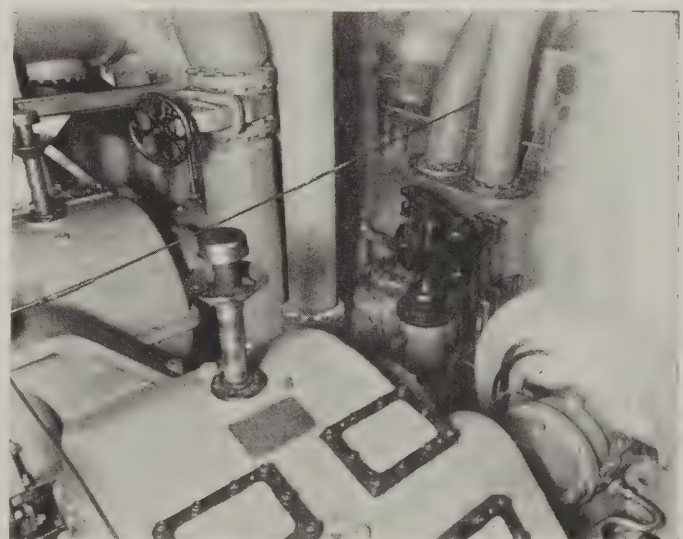
Wave length	Speed	Frequency
0.20	12	61
0.04	27	680
0.02	38	1,930

Since large waves increase in speed as they grow longer while surface tension waves decrease in speed, there must be some minimum speed for little waves, little enough to feel the effect of both surface tension and gravity. The theory shows that such a wave would be 0.68 inch long and that it would have a speed of 0.76 feet per second or 0.45 of a sea mile per hour. This result agrees with an observation by Scott Russell that a wind with a velocity of half a mile an hour can start a ripple on the surface of still water; this ripple soon disappears if the wind dies down. The same observer says that true waves appear when the wind has a velocity of two miles an hour, which is the speed of trochoidal waves 2.2 feet long.

The writer once tried to determine how long ship's models for the towing tank should be to avoid capillary interference with wave formation in the wake of the model. Assuming that such effect should be less than one percent, the minimum speed of the model was computed to be 0.78 knot. Now models are tested at what corresponds to full speed and at fractions of that speed. If we assume that a model may be tested at quarter speed, then the full model speed should not be less than three knots. The law of similarity shows that, if a model of the ship is 12 feet long and the ship is 588 feet long, the full speeds of the ship and the model will be twenty-one and three knots respectively. This falls in with customary practice. The size of models is determined by other matters, such as convenience in measuring and recording results in the model towing basins. At the Washington model basin and at one or two others models twenty feet long have been used; at the greater number of experimental stations the models have been about twelve feet long and this is probably the minimum length for best practical results.

Turbine Governor Enables S. S. Mount Carroll to Maintain Speed in Record-Breaking Storm

DURING the very severe storms that swept the Atlantic during the early part of January of this year, many vessels, embarrassed by racing propellers, were compelled to proceed at reduced speeds; but the S. S. *Mount*



Operating Mechanism of Oil-Type Governor Mounted at Rear of Maneuvering-Valve Chest

Carroll of the United American Lines was able to maintain her regular 13 knots through the worst of the blow and had the pleasure of passing many liners that under ordinary

(Continued on page 183)

Strength of Column-Supported Foundations

Analysis of Stresses in Various Parts of Condenser Foundation, Assuming Maximum Inclination of Ship

By John Flodin

TO illustrate the principles underlying the strength calculations for high, column-supported foundations, the condenser foundations shown in Fig. 1 will be considered. This construction is worthy of particular attention partly because of the height of the structure, which is due to the necessity of placing other auxiliary machinery below the

ingly large fiber stress, say about 17,000 pounds per square inch.

STRESS ANALYSIS

When the ship is in the upright position the columns will act in compression, if they are "short"; otherwise the bend-

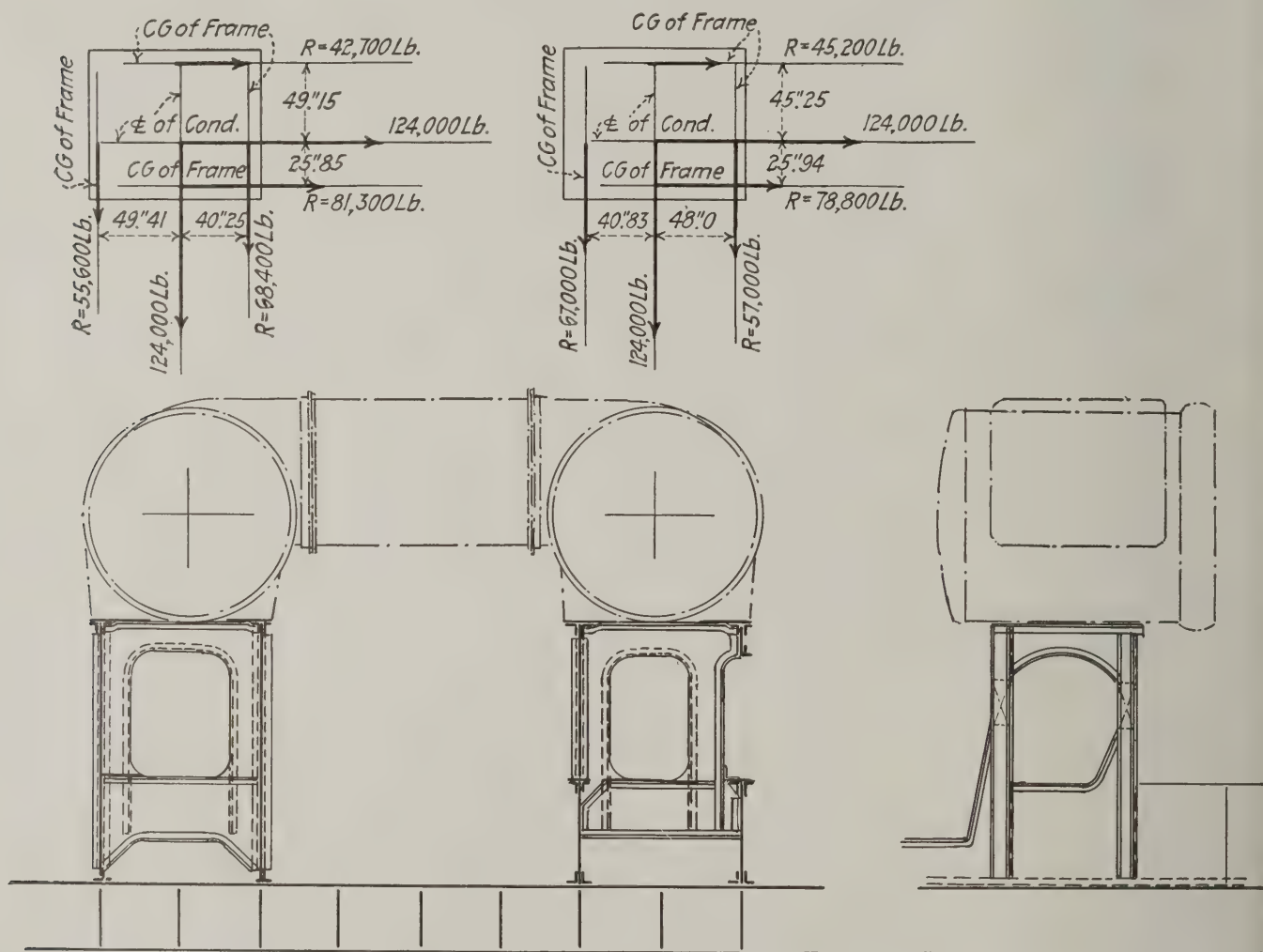


Fig. 1

condensers, and partly because of the size of the condensers, it being estimated that the wet weight of each condenser plus one-half of the weight of the connecting exhaust trunk equals 124,000 pounds.

It is not the object here to attempt an exact determination of the loads on the foundations due to the above weight, but rather to analyze the stresses in the various parts of the foundation structure, assuming that the loads have been determined with a satisfactory degree of accuracy. For our purposes we may, then, omit all dynamic considerations and as a rough but safe approximation assume a maximum inclination of the ship, both in the transverse and in the fore-and-aft direction, of 90 degrees. The error thus introduced may readily be compensated for by allowing a correspond-

ing stresses they are subjected to may be calculated in the ordinary manner by means of any of the well-known formulæ. In this connection it should be noted that the centers of the condensers are not vertically above the centers of the foundations, so that the distribution of the loads on the frames forming the ends and sides of the foundations is inversely proportional to the distances of the horizontal projection of the center of gravity of each condenser from the frames supporting that condenser, which also applies when the ship is inclined. These partial loads, designated R in the following, are indicated in Fig. 1 together with the distances from the projections of the centers of the condensers to the sectional centers of gravity of the foundation frames. For estimating column loads when the ship is in the upright

position, this breaking-up process must, of course, be carried one step further.

When the ship is inclined, each frame (i.e., two columns and their connecting overhead girder) may now be regarded independently of the rest of the structure and the stresses analyzed. From Fig. 2 we see at once that there is direct shear in the columns, but since this stress may be found in the ordinary manner no attention will be given to it here. It will also be seen that a tipping moment LR is set up, tending to tear the foundation away from the ship's struc-

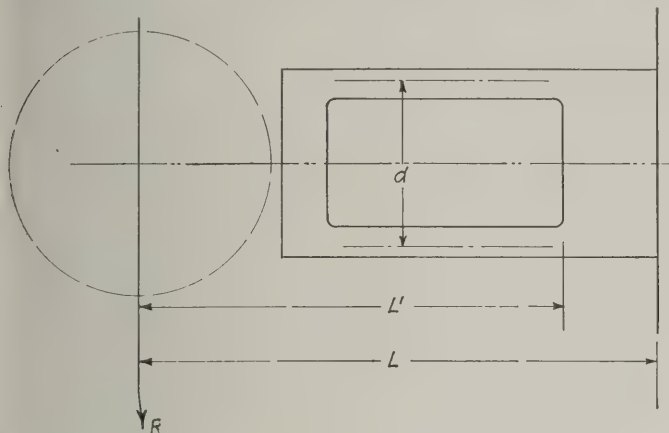


Fig. 2

ture, and that a further moment $L'R$ causes tension in the upper column in Fig. 2 and compression in the lower column. The former moment we shall neglect in this discussion since it is external to the foundation itself, but the latter moment, $L'R$, introduces stresses within the foundation, which are not negligible. This moment is resisted by the moment Fd , where F is the tension or compression in the column and d is the distance between the sectional centers of gravity of the columns. We may then write

$$F = \frac{L'R}{d} \dots\dots\dots (1)$$

This is not, however, the total stress in either column, since each frame acts as a cantilever as indicated by full

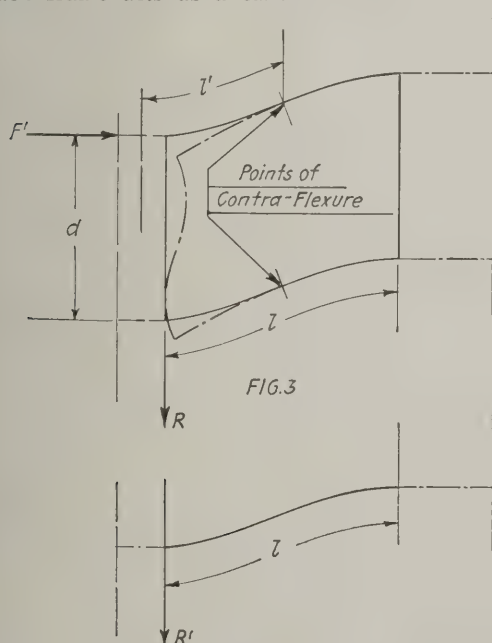


Fig. 4

lines in Fig. 3. If the upper or free ends of the two columns are rigidly connected by means of a girder, those ends are bound to move together, and to move in such a manner that

they will always remain parallel to their initial positions. We have, in other words, a case of cantilevers with constraint which resembles very closely the condition often found in bridge portals under wind load. Retaining the condition that the free ends of the cantilevers must deflect so as to remain parallel to the initial position, we may, for convenience, discard the connecting girder and say that each cantilever (or column) carries such a part P of the total load R on the foundation frame, that both cantilevers deflect an equal amount. Either cantilever is then represented by Fig. 4, where l is the free length. The bending moment of this cantilever is zero at the point of contraflexure (i.e., at the half-length, if the column is of uniform section) and is maximum at either end, where

$$M = \frac{1}{2} Pl \dots\dots\dots (2)^*$$

The total fiber stress in any column may now be found by combining the results from formulæ (2) and (3), both quantities being expressed in pounds per square inch. In lieu of the rather cumbersome process of combining direct tension or direct compression with the tension or compression due to bending, sums obtained by simple addition may be accepted as sufficiently accurate except where the sum of the compressive stresses approaches the maximum allowable unit stress to within, say, 5 percent.

Obviously we are justified in considering the columns as cantilevers with constraint only in case the conditions of rigidity at the bases of the columns and at the connections to the overhead girders are satisfied, and provided the overhead girder is rigid enough to prevent appreciable deflection of the kind shown by dot-and-dash lines in Fig. 3. The first two of these requirements are taken care of by filleting corners or by taking the free lengths of the columns as extending well into the brackets, as conditions may dictate; but the last named prerequisite for the use of formula (2) requires more careful consideration since it means that bending stresses are set up in the horizontal overhead girder.

The magnitude of these stresses may be determined from the following: As indicated in Fig. 3, points of contraflexure occur at the mid-length of the columns, while the

bending moment at the ends of the columns is $\frac{1}{2} Pl$, which

is the moment formula for a free-ended cantilever of one-half the length of the cantilever with constraint. This means that we may regard the columns as cut at the points of contraflexure and apply the loads P at the free ends thus obtained, without changing the values of the moments. It is now readily seen that the bending moment in the overhead girder becomes

$$M' = \frac{1}{2} Pl' \dots\dots\dots (3)$$

where l' is the distance from the point of contra-flexure in the column to the sectional center of gravity of the overhead girder, as shown in Fig. 3. It must be borne in mind, however, that if the columns of any one foundation frame are not of equal section, the magnitude of P will vary in direct proportion to the section moduli of the columns, and the larger value for P must, of course, be used in finding the bending moment in the girder for that frame.

It is not desired to give the impression that these bending formulæ will give satisfactory results regardless of the relative sizes of the columns. It is quite conceivable that, for example, the upper column in Fig. 3 might be so light that it would fail in tension while the lower column deflected as

*See Merriman, Mechanics of Materials, Article 65, page 163, 10th Edition.

a free-ended cantilever and the overhead girder remained straight. In such a case the bending moment in the overhead girder may be expressed by $M' = F'd$, where M' is the moment found from (3) and d is the distance between centers of columns. Then $F' = M'/d =$ the tension the upper column must sustain in order to cause the overhead

girder to deflect so that the lower column may act as a cantilever with constraint. From this consideration it is seen that formula (2) becomes inapplicable, if there is too great variation in the section moduli of the four columns of either foundation, unless the fiber stresses are kept correspondingly low.

The Duties of a Marine Superintendent

The marine superintendent of a steamship company is looked upon by many as an individual who has been able, by some means, to obtain one of the most desirable positions in the gift of a ship operating company. A general idea prevails that he looks after the upkeep of the company's fleet but the details of just what he is supposed to do are not so generally known. The following is a brief outline of some of his duties as directly affecting the operation of a ship.

THE principal responsibility of the marine superintendent of a steamship company is to keep the company's vessels in fit condition to meet their schedules and this keeps him continually moving in a maze of arrival dates, discharge dates, cargo cancellation dates, dates on loading berth and sailing dates. All repairs and alterations required must be arranged and undertaken so as not to interfere with the above dates.

This is a problem at all times as it is natural to endeavor to start loading as soon after discharge as possible. Hold repairs are, therefore, always urgent, the time allowed being limited, if possible, to the time necessary to clean the holds before again loading. In the case of engine room repairs there is more time but even here it is desirable to complete all work, or the major part of it, a couple of days before sailing in order to try out the machinery and have time to undertake contingencies that may develop.

Every job is therefore a rush job and, as excuses will not avail, should delay of the ship occur through uncompleted repairs, the marine superintendent must be forever in touch with his work to guard against those undertaking the repairs falling down on their completion dates.

VESSEL IS INSPECTED PROMPTLY UPON ARRIVAL

Upon the arrival of a ship the first thing done is to visit the vessel and look it over so far as possible (the holds naturally will be inaccessible) and determine the repairs necessary to maintain the vessel in proper operating condition. To assist in this and to save time, the captain and chief engineer should have repair lists ready that were prepared on the trip. These lists are of great value, if carefully prepared, and can be made the means of saving a great deal of time.

Contracts are then prepared and let for such work as is deemed necessary by the marine superintendent, the awards being made after consideration of bids submitted and the ability of the contractor to meet the completion dates required as determined by experience gained from previous work.

While the placing in hand and supervision of repairs during a vessel's stay in port are sufficient to keep the marine superintendent hustling, there are other duties which he must watch out for and which are liable to delay the vessel, if overlooked. Some of these are as follows:

PERIODICAL DRY DOCKING OF THE VESSELS

In order to obtain efficient operation of the vessel and conserve fuel it is customary to dry dock a passenger ship about every six months and a cargo ship about every eight months for routine examination of bottom, painting and overhauling of sea valves. In this connection he must also be sure to notify the United States Local Steamboat Inspectors,

as the law requires that such notification be made whenever a ship is placed on dry dock for repairs.

The United States Steamboat Inspection and the American Bureau of Shipping requirements are that tail shafts be drawn for examination every three years in the case of shafts fitted with solid liners and every two years where two short liners are fitted. The classification society and local inspectors are very prompt in following up the drawing of tail shafts and, unless a careful check is kept on these, an operator will be very likely to have his ship denied clearance until it has been dry docked and the tail shaft drawn for examination.

It is not always possible or necessary for a United States local inspector to attend every dry docking of a ship because of the irregular times at which dockings are made and the limited staff in the local office. The requirements of the law must be met, however, and the inspectors notified so that the dry docking will be covered, if the local office deems it necessary.

The same applies in the case of tail shafts. An earnest endeavor is made by the inspectors to cover each drawing of a tail shaft but an inspector has not the time to stand around several hours waiting for a shaft to be drawn and an operator cannot be expected reasonably to hold a ship on dry dock, with the tail shaft out, until an inspector can get there to examine it. The local office requires that a report be submitted, however, in all cases where a tail shaft has been drawn and an examination not made by a United States inspector.

This report must state the time and place of drawing and the condition of the shaft. In making this report, the marine superintendent has two alternatives. He may secure a certificate from the American Bureau of Shipping giving the report of their inspector (the American Bureau maintains resident or district inspectors so that it is possible for them to cover all cases) or he may secure an affidavit stating the condition of the shaft from the chief engineer of the vessel.

Either of the foregoing are acceptable to the United States local inspectors.

ANNUAL INSPECTION

The laws of the United States require that all vessels under the jurisdiction of the United States Steamboat Inspection Service be inspected annually and no vessel will be cleared from any port unless it has on board an unexpired certificate of inspection (except in a special case where a vessel whose certificate has expired is permitted to sail to another port for repairs, in which event, however, no passengers or freight are permitted to be carried en route).

It is therefore incumbent that the marine superintendent

keep informed at all times regarding the expiration dates of his ships' certificates and make arrangements for putting them through their annual inspections in time to allow for making such repairs as may be required by the United States local inspectors in time to secure new certificates before their scheduled sailing dates.

RE-CLASSIFICATION SURVEYS

Another date that must be kept in mind is the date the re-classification surveys required by the American Bureau of Shipping are due. These surveys are due at intervals of four years and must be carried out, if the vessel is to be retained in her class.

On account of the amount of work involved and in order to interfere as little as possible with the sailing schedule of the vessel, the American Bureau of Shipping allows one year for the carrying out of this survey.

It is in the interest of the owner, however, for the marine superintendent to put the vessel through her re-class survey as quickly as possible after it becomes due.

The following is a brief outline of the work necessary to put a vessel through a re-class survey:

DECK

1. Ship to be dry docked.
2. Bottom to be cleaned for examination.
3. Bottom to be painted with coat of anti-corrosive, one coat of anti-fouling.
4. Rudder to be lifted for examination of pintles and gudgeons.
5. The holds, between decks, peaks, bilges and the surface of the framing and plating to be cleaned, and also engine and boiler spaces and bunkers to be cleaned out.
6. Platform plates in engine and boiler room to be lifted.
7. In the holds, and bunkers, one strake of sheathing to be removed and strake of ceiling fore and aft and all portable hatches to be lifted.
8. Double bottom tanks to be thoroughly cleaned out, all ceilings to be lifted from tank tops, tanks to be tested with water pressure to the height of load line. Tank tops to be cleaned and coated with approved material and all ceilings re-laid.
9. Deep tanks, peaks, fresh water tanks and oil fuel tanks which form part of the structure of the vessel to be cleaned out and have water test of eight (8) feet above tank or the load line.
10. A steel plate one-half ($\frac{1}{2}$) inch thick to be fitted below sounding pipe so that rod will strike on it.
11. All parts of steering arrangement together with the blocks, rods or other transmission gear all to be opened up for examination.
12. Windlass and hand deck pumps to be stripped and opened up.
13. The sluice and watertight doors freed up and put in good working order.

NOTE: In oil tank vessels: All tanks cleaned and proven freed of gas. Each compartment and cofferdam to be tested with a head of water up to the top of the expansion trunk hatchways.

ENGINE

14. Tail shaft to be drawn. (Get record of last drawing.)
15. All cylinders, or turbines, pistons, valves, pumps, condensers, thrust blocks, main and tunnel bearings, shafting, evaporators and steam steering gear to be opened up for examination.
16. All valves on all manifolds running to double bottoms and bilges to be opened up for examinations, spindles, valves and seats left exposed.
17. All boilers and superheaters and all valves and mountings on all boilers to be opened up for examination, leaving valves, spindles, seats and springs exposed, which includes main and auxiliary stops, gage glass stops, test cocks, whistle stops, surface and bottom blows, safety valves, main and auxiliary feed checks and stops.
18. All main steam pipes, if of copper, to be annealed and tested by hydraulic pressure.
19. After examination all parts of whatever description that are passed by surveyor to be closed in good order as before.

The foregoing may be divided over several turn-arounds in which case the marine superintendent must keep in touch with the outstanding items to be put in hand on the vessel's return.

GRAIN FITTINGS

In all cases where a vessel is fitted for the carriage of grain it is necessary that a certificate approving the grain fittings be obtained from the Board of Underwriters. A clause is usually inserted in the grain fitting contract requiring the contractor installing the fittings to secure this certificate and deliver it to the ship.

Failure to obtain such a certificate is apt to delay a vessel's departure and is also likely to cause additional outlay of money, if a vessel is fitted for the carriage of grain in one port and proceeds to another port to load. Such a case recently came to the attention of the writer where a vessel was fitted for grain in a United States port and proceeded to Canada to load. Due to failure to obtain a certificate from the Board of Underwriters in the port where the grain fittings were installed the Canadian Underwriters (who would have recognized such a certificate had it been on board) demanded changes and additional work which equaled the cost of the original installation.

UNITED STATES SALVAGE ASSOCIATION

A comparatively new association which came into being during the World War, and which is assuming a position of importance in marine circles, is the United States Salvage Association. This association is covering a large number of vessels under American registry (all Shipping Board vessels are subject to their surveys), the principal object being to conduct inspections and make reports relative to the cargo carrying condition of a vessel.

Inasmuch as the Board of Underwriters accepts the reports of the United States Salvage Association and a favorable report is reflected in a reduction in insurance rates, it behooves a marine superintendent in charge of a ship subject to these inspections to see that any recommendations made are carried out.

CONCLUSION

In conclusion let it be noted that the position of a marine superintendent is one that requires the experience of an "old timer" in the marine game.

The men usually appointed to this work are former masters or chief engineers who have been thoroughly initiated into the mysteries of ship operation. That even such experienced men will have no time for non-essential work will be apparent from the foregoing outline of some of their more important duties.

Turbine Governor Enables S. S. Mount Carroll to Maintain Speed

(Continued from page 179)

circumstances could outdistance her. J. P. Stafford, chief engineer of the *Mount Carroll*, states that his hand-picked engine-room crew was chiefly responsible for this performance, but he also gives great credit to the governor, with which the *Mount Carroll's* Westinghouse turbine is equipped, because it kept the propellers at practically constant speed regardless of whether they were in the water or out of it.

This governor is of a new type which automatically keeps the turbines from racing when the vessel is light or when the screws come out of the water. The mechanism is not operated by steam in the usual manner, since deposits of dirt from the steam sometimes interfere with the extreme reliability of operation that is essential for a governor. Instead, oil under pressure, derived from the lubricating supply of the turbine, which is necessarily always available, is used; and the controlling pressure is maintained by a small centrifugal pump mounted on the turbine shaft. By this arrangement, the variations in the turbine speed vary the oil pressure directly and instantly.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Boiler Requirements for Marine Engine

Q. (1186).—I have a letter from a company selling boilers, and they estimate my requirement to be 1,000 pounds steam per hour for a small marine engine. How do they know that the engine will require that amount of steam per hour, and what do they mean by 1,000 pounds per hour without giving boiler pressure?—Engineer.

A. (1186).—Unless the company was given such information relative to the engine to be served as indicated horsepower or dimensions, revolutions per minute and steam chest pressure, there seems to be no way of determining the amount of steam required. In the former case the pounds of steam per indicated horsepower per hour might have been assumed and then multiplied by the indicated horsepower. In the latter case the indicated horsepower might have been worked out from the dimensions and again the pounds of steam assumed and multiplied by the estimated indicated horsepower.

Mechanical Efficiency of a Two-Cycle Oil Engine

Q. (1189).—Please tell me what would be the probable efficiency of a Beardmore engine, two cycle, 200 brake horsepower, 300 revolutions per minute, marine engine with separate compressor. Would the efficiency be between 68 and 73 percent or would it be higher? V. C.

A. (1189).—The mechanical efficiency of the engine to which you refer would be, from the information given, about 70 percent.

Diameter of Engine Shaft

Q. (1191).—What size shaft should be installed for a 100 horsepower triple expansion engine, turning about 220 revolutions per minute?

A. (1191).—As the data given are insufficient for determining the crank shaft diameter, certain values have been assumed, where lacking, in order to solve the problem.

D = diameter of shaft in inches.
 F = maximum turning force.
 M = bending moment in inch pounds.
 $R. P. M.$ = revolutions per minute = 220.
 T = maximum twisting moment in inch pounds.
 T_1 = equivalent twisting moment in inch pounds.
 f = maximum allowed stress in pounds per square inch = 5,500.
 r = radius of crank in inches = 4 inches assumed.
 $I. H. P.$ = indicated horsepower = 100.
 k = a constant depending upon the number and arrangement of cranks = 1.32 (for three crank, triple expansion engines).
 L = distance between bearings + a certain distance inside the bearing, assumed as 7 inches + $(2 \times \frac{1}{4} \text{ inch}) = 7\frac{1}{2}$ inches.

$$T = \frac{I. H. P. \times k \times 63,024}{R. P. M.} = \frac{100 \times 1.32 \times 63,024}{220} = 37,810$$

$$F = \frac{T}{r} = \frac{37,810}{4} = 9,453.$$

$$M = \frac{F \times L}{8} = \frac{9,453 \times 7.5}{8} = 8,862$$

$$T_1 = M + \sqrt{M^2 + T^2} = 8,862 + \sqrt{(8,862)^2 + (37,810)^2} = 47,678$$

$$D = \sqrt[3]{\frac{5.1 \times T_1}{f}} = \sqrt[3]{\frac{5.1 \times 47,678}{5,500}} = 3.54 \text{ or } 3\frac{1}{2} \text{ inches.}$$

Piston Clearance—Engine Power Ratings

Q. (1191).—(1) What allowance should be made for clearance in piston and cylinder diameters?
 (2) What is the relation between the power ratings of steam reciprocating and oil engines?

A. (1191).—(1) The following differences between the diameter of a piston and the bore of a cylinder have been found satisfactory where solid or plug pistons have been used:

inches	Allowance, inches
To 4	0.002
To 8	0.003
To 12	0.006
To 16	0.008
To 24	0.011
To 28	0.012
To 34	0.015

(2) Oil and gas engine powers are based upon the power delivered by the shaft, known as brake horsepower while steam reciprocating engines are rated upon the power developed in the cylinders or indicated horsepower. The mechanical efficiency of the average reciprocating engine is about 92 percent; therefore, to put the two engines upon the same basis the oil engine would be developing 150 brake horsepower while the steam engine would have an output of $150 \times 0.92 = 138$ brake horsepower.

Safe Working Pressure of Scotch Boiler

Q. (1153).—Please give the formula showing how to find the safe working pressure of a double ended Scotch boiler, 16 feet 9 inches long and 6 feet diameter, with triple riveted longitudinal seams, thickness of plate 1.08 inches, tensile strength 54,000 pounds per square inch.

A. (1153).—Since insufficient data have been given in the question from which to make a specific calculation, it is assumed that the boiler has already been designed and that a method only for determining the safe working pressure is desired.

According to the General Rules and Regulations of the United States Steamboat Inspection Service the working steam pressure allowable for any dimension of boilers must be ascertained by the following rule:

"Multiply one-sixth of the lowest tensile strength found stamped on the plates in the cylindrical shell by the thickness—expressed in inches or parts of an inch—and divide by the radius or half diameter, also expressed in inches, and the result will be the pressure allowable per square inch of surface for single riveting, to which add 20 percent where the longitudinal laps of the cylindrical parts of such boiler are double riveted, when all the rivet holes of such boiler, including steam and mud drums, have been fairly drilled

and no part of such holes has been punched. The pressure allowed shall be based on the plate whose tensile strength multiplied by its thickness gives the lowest product."

Using the figures given, your problem works out as follows:

$$1/6 \times 54,000 = 9,000.$$

$$9,000 \times 1.08 = 9,720.$$

$$9,720$$

$$\frac{9,720}{36} = 270 \text{ pounds per square inch, for single riveting.}$$

Add 20 percent to the above result for double riveting and the allowable safe working pressure becomes 324 pounds per square inch.

NEW BOOKS

NAVAL ARCHITECTURE. By W. M. Gray, B.Sc. Size, 5½ inches by 8½ inches. Pages, 201. Diagrams, 100. London, 1923. Methuen and Company, Ltd.

This is a new classbook on naval architecture by the lecturer on naval architecture at the Royal Technical College, Glasgow. The writer has very sensibly confined himself to the science of floating bodies as represented by buoyancy, stability and trim with a chapter on launching and one on riveted joints. Each chapter is followed by questions covering the matter dealt with, and diagrams are freely employed to explain and illustrate the text.

The various subjects have been treated in a clear and simple, as well as a thorough manner, and many students will prefer Mr. Gray's treatment to that in earlier textbooks. New and practical examples of the application of various theories are presented which will serve to stimulate the interest of students without covering too much ground.

The book is excellently printed and bound and is highly recommended for its practical value to all interested in the calculations of ship design.

THEORETICAL NAVAL ARCHITECTURE. By E. L. Atwood, O.B.E. Size, 5 inches by 7¼ inches. Pages, 512. Many diagrams, 6 folding plates. New York, 1923. Longmans, Green and Company.

This is really the eighth edition of the "Text Book of Naval Architecture" first published in 1899 and a standard work of reference in nearly every ship drawing office. But in this latest edition the name has been slightly changed and the scope very considerably increased by the inclusion of chapters dealing with speed calculations, strength, screw propulsion, steering, etc.

The earlier chapters deal concisely with the mathematics of a floating body and have undergone little change in this latest edition, though where there has been a development in theory or method this has not been overlooked, as is evidenced by the treatment of Tchebycheff's rules, Smith's buoyancy correction and the use of the integrator.

There is a chapter also on the Trochoidal Wave Theory which the writer does not remember to have seen dealt with elsewhere outside of Biles' exhaustive "Design and Construction of Ships." In the chapter on Horsepower and Speed there has been made of A. W. John's curves of Residuary Resistance—a very good method but one little used, and for which little data are available. Without space to deal with the form of ships for minimum resistance any method of calculation of power is of little use, and it might have been better if the author had confined himself to explaining the forms of data now in use with their limitations.

The chapter on propellers is also much too short to deal with the matter thoroughly and might well have been omitted from a classbook of this kind.

But any criticism of the work must not detract from a very hearty appreciation of the volume as a whole, and the feeling that for many years to come this book will continue to be one of the indispensables for those who design ships.

The volume concludes with a valuable bibliography in which we notice MARINE ENGINEERING AND SHIPPING AGE finds a place.

PERSONAL MENTION

J. M. WILLIS, general manager of the Baltimore Dry Docks plant of the Bethlehem Shipbuilding Corporation, Ltd., became general manager of the Baltimore Dry Docks Works and Sparrow's Point Works, of the Baltimore plant, Bethlehem Shipbuilding Corporation, Ltd., on March 1, following the consolidation of the shipbuilding and ship repairing interests of the Bethlehem Shipbuilding Corporation, Ltd., in the Baltimore district under one local management with headquarters at Sparrow's Point, Md.

JOHN W. CANTILLION, secretary of the American Bureau of Shipping, completed twenty-five years of service with this institution on February 15, which was also the twenty-fifth anniversary of the date on



J. W. Cantillion

which the battleship *Maine* was blown up in Havana Harbor. Mr. Cantillion joined the American Shipmasters' Association on February 15, 1898. This association was the parent of the present Bureau, the name being changed in November, 1898. At this time the staff consisted of E. Platt Stratton, chief surveyor; J. S. Ritchie, engineer and ship surveyor for steel vessels; Capt. F. A. Martin, consulting surveyor and chairman of the classification committee; Capt. Austin Jayne and Capt. B. F. Cutler, surveyors of wood vessels. While the construction of wooden vessels flourished the Bureau was very active and, when the steel ship construction increased, the staff of surveyors was also amplified. The American Shipmasters' Association, as the American Bureau of Shipping was originally known, was formed in 1862 by the underwriters, shipbuilders and shipowners and these three important branches of the maritime fraternity are still component parts of the organization and are represented in the administration of its affairs. In 1908 this organization, known as the United States Standard Shipbuilders', Shipowners' and Underwriters' Association, was amalgamated with the American Bureau of Shipping. On October 21, 1913, John W. Cantillion was elected secretary of the Bureau, in which office he has continued until the present. In September, 1915, representatives of the shipbuilders, shipowners and underwriters believed that if the Bureau was to be continued it would have to be reorganized. After careful investigation and consideration the committee having induced Stevenson Taylor to become president, the Bureau was reorganized on February 28, 1916, at a meeting of the board of managers. At this meeting Stevenson Taylor was elected president; A. C. Pessano, F. G. Macomber, L. F. Burr and W. H. Todd, vice-presidents, and John W. Cantillion secretary and treasurer. Mr. Cantillion has seen this now efficient organization grow from an infant's size

in wing

with five surveyors to a full man's size organization with branch offices in the principal seaports of the United States and in Tampico, Havana, Rio de Janeiro, Buenos Aires, Balboa, Antwerp, Havre and Hamburg. To the man on the street interested in maritime matters he is known only as John, always endeavoring to aid them in obtaining the facts they desire relative to ships and carrying out the cardinal principles of the Bureau's charter, viz., to disseminate information upon subjects of marine and commercial interest and to aid and develop the American merchant marine.

H. G. SMITH, whose appointment as vice-president of the Bethlehem Shipbuilding Corporation, Ltd., in charge of sales, on January 11 was announced in our last issue, graduated from the United States Naval Academy in 1891 and from the course of naval architecture at the Royal Naval College, Greenwich, England, in 1894. From 1893 to 1903 he served in the Navy as assistant navy constructor and naval constructor, being on duty at the plant of William Cramp and Sons Ship and Engine Building Company, Philadelphia, Pa., from 1894 to 1898 during the building of the *Indiana*, *Massachusetts*, *Brooklyn* and *Iowa*, and also during the period when the American liners *St. Louis* and *St. Paul* were under construction in that yard. From 1898 to 1901 he was on duty at the New York Navy Yard, Brooklyn, N. Y., in charge of ship repairs and the docking of vessels. From April, 1901, until November, 1903, he was on duty in Washington as assistant to the chief constructor of the Navy in charge of designs and current work. Naval Constructor Smith resigned from the Navy on November 1, 1903, and accepted the position of manager of the Fore River Ship and Engine Company, later the Fore River Shipbuilding Corporation and now the Fore River Plant of the Bethlehem Shipbuilding Corporation, Ltd. From 1913 until 1917 Mr. Smith was vice-president and general manager of the Fore River Shipbuilding Corporation and from 1917 until 1920 manager of the Bethlehem Shipbuilding Corporation, Ltd. From 1920 until his present appointment Mr. Smith was assistant to the president of the Bethlehem Shipbuilding Corporation, Ltd.

W. W. SHERLOCK, formerly associated with the Kerr Chartering Company, has now organized a ship brokerage agency with offices in the Maritime Exchange, New York.

A. W. CHRISTIAN has been appointed general sales agent of the Bethlehem Shipbuilding Corporation, Ltd., with offices at 25 Broadway, New York City, to succeed E. B. Germain, resigned.

ALBERT W. HONYWILL, JR. has severed his connections with the Terry Steam Turbine Company, at Hartford, Conn., to take up new duties as assistant to the president of the Diamond Power Specialty Corporation of Detroit.

J. O. PERSONS, SR., formerly New York representative of the Baltimore Dry Dock and Shipbuilding Company and more recently with the Shipping Board, is now representing the Maryland Dry Dock Company, Baltimore, Md., in New York.

CLOYD M. CHAPMAN has become affiliated with Dwight P. Robinson & Company, Incorporated, as consulting materials engineer. Mr. Chapman, who has been active in the work

of the American Society of Testing Materials and the American Concrete Institute, will in the future represent Dwight P. Robinson & Company in the committee work of these societies.

B. H. KNIGHT has been made manager of the Ocean Traffic Bureau of Philadelphia, according to an announcement given out by the president, George F. Sproule.

J. C. JENKINS, director of industrial relations of the United States Shipping Board, has succeeded Capt. Irving L. Evans, who recently resigned, as director of the Sea Service Bureau of the Board. Mr. Jenkins will have full charge of the recruiting service.

PETER J. SHOMER, of The Shomer Company, 510 Kirby Building, Cleveland, O., has been appointed by Row & Davis Engineers, Inc., New York, as their representative in the Great Lakes District. Mr. Shomer was formerly associated with the American Shipbuilding Company, of Cleveland, O.

JOHN HUMBLE, retired shipbuilder, died on February 6 at his home in Buffalo, N. Y. Mr. Humble served an apprenticeship in the Buffalo shipyards, working on some of the first steamships built on the Great Lakes. He founded the firm of Parsons & Humble, shipbuilders, who built the largest wooden hull steamships ever used on the lakes.

A. B. BARBER, of Portland, Oregon, has been appointed manager of the Department of Transportation and Communication of the Chamber of Commerce of the United States, succeeding J. Rowland Bibbins, who has resigned to take up private engineering practice. For the past three years, Mr. Barber served as technical adviser to the Republic of Poland, having been nominated for that work in 1919 by Secretary Hoover, on request of the Polish Government to designate an American engineer to assist in the organization of the railways, coal industry and other technical services. Mr. Barber is a graduate of West Point. Prior to his resignation from the army three years ago to become head of the American technical staff for Poland, he had wide experience with the United States Army Engineers. Soon after the entry of the United States into the war, he was sent to France with a railway commission to report on the needs of the French railways supplying the Allied troops. Later he was assigned to General Pershing's staff, in connection with organization, transportation and overseas shipping. From June to November, 1918, he was at the front with the First Corps, and First and Second Armies. After the armistice, he was assigned to the American Relief Administration, handling the transportation of relief supplies to the various countries of Central Europe. The department, of which Mr. Barber is head, handles the activities of the United States Chamber of Commerce in connection with shipping, ocean and inland; steam and electric railroads, motor transportation; aeronautics and the like.

CAPTAIN IRVING L. EVANS, for several years Director of the Sea Service Bureau of the United States Shipping Board, has resigned that position, according to announcement made by Commissioner T. V. O'Connor, of the Shipping Board. The Sea Service Bureau has been placed under the Division of Industrial Relations, and J. C. Jenkins, Director of Industrial Relations, will have full charge of the Recruiting Service as Director of that division of the Shipping Board.



H. G. Smith



Col. A. B. Barber

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

North Atlantic Ports Association Started

AT the request of Mr. F. S. Davis, manager of the maritime department of the Boston Chamber of Commerce, a preliminary conference to discuss the advisability of organizing a North Atlantic Ports Association was held in the Commodore Hotel, New York, February 6. Representatives were present from the following organizations:

Directors of the Port of Portland, Maine; Portland Chamber of Commerce, Portland, Me.; Maritime Department of the Boston Chamber of Commerce, Boston, Mass.; Providence Chamber of Commerce, Providence R. I.; New London Chamber of Commerce, New London, Conn. and State of Connecticut; Maritime Association of the Port of New York, New York City; Philadelphia Maritime Exchange, Philadelphia, Pa.; Export & Import Board of Trade, Baltimore, Md.; Baltimore Chamber of Commerce, Baltimore, Md.; Hampton Roads Maritime Exchange, Norfolk and Newport News, Va.

The meeting was called to order by Mr. Davis, who stated briefly the purposes of the conference, viz: "To consider the advisability of forming an organization representative of the North Atlantic Ports as a group, its scope, if formed, and membership, calling attention to the very effective work being done by other similarly constituted port group organizations, such as the South Atlantic Maritime Association and the Mississippi Valley Association, and the West Coast Ports Association." Mr. Davis was elected temporary chairman and Harry M. Thompson, secretary, Hampton Roads Maritime Exchange, temporary secretary.

The chairman called upon each representative for an expression of opinion as regards the purposes of the meeting and all present expressed themselves as being in the main favorably disposed towards forming such an organization which should function along broad general lines, to protect the North Atlantic Group of Ports. In the discussion, however, it developed that there existed some considerable difference of opinion as to the scope of such an organization, if formed, particularly with regard to the propriety of entering into any technical dispute or action.

The following resolutions were adopted:

RESOLUTIONS ADOPTED

Resolved: That it is the sense of this meeting that a North Atlantic Ports Association be formed, subject to the ratification of each organization here represented.

Resolved: "That all commercial organizations of each port on the North Atlantic be eligible to membership in this proposed organization, excluding any such whose obligations and interest extend beyond the port."

Upon motion duly seconded and carried, the present chairman and secretary were continued until a permanent organization effected and their successors duly elected. No action was taken in regard to the appointment of a committee on rules and

Bids Open March 14 for Million and a Half Reconditioning Job on Ward Liners Orizaba and Siboney

BIDS will be received at the office of Theodore E. Ferris, naval architect and marine engineer, New York City, until March 14, for the work of reconditioning the steamships *Orizaba* and *Siboney*, of the New York and Cuba Mail Steamship Company (Ward Line). It is understood that the contract, which provides for the construction of additional deck space and deckhouse extensions, furnishings, etc., will involve a total expenditure of close to \$1,500,000. The vessels are to be back in service next October.

Both ships, which were originally designed as twin screw freight and passenger steamers, have an overall length of 443 feet 3 inches, beam molded 60 feet, depth molded to shelter deck 35 feet, and are of the shelter deck type with decks as follows: boat deck, "A" deck, "B" deck, "C" deck, "D" deck, "E" deck and "F" deck. The propelling plant consists of eight single ended Scotch boilers with two firerooms; twin screws, reduction gear, turbine machinery, oil burning. The vessels were built by the William Cramp and Sons Ship and Engine Building Company.

GENERAL WORK

Both steamers are to be drydocked and undergo special No. 1 survey to Lloyds' Register of Shipping, both port and starboard tail shafts of both vessels are to be drawn for examination, the military mast located between the smokestacks is to be removed, fore and main masts are to be

by-laws, and other committees, pending a full attendance of all organizations not represented at the first meeting, and it was agreed that haste in this phase of the matter was not desirable, but in order to accelerate matters, all present were requested to supply the secretary with a list of the names of such organizations in his port as were considered eligible, which would be consolidated and sent by the secretary to those present, with the call for the next meeting, which it was agreed, upon the invitation of the secretary of the Maritime Association of the Port of New York, would be held in the board room of the New York Maritime Exchange in about a month hence, date being left to the chairman.

Farrell Calls Foreign Traders to Meet in New Orleans

JAMES A. FARRELL, chairman, National Foreign Trade Council, and president, United States Steel Corporation, has called the Foreign Traders of the United States to meet at the Tenth National Foreign Trade Convention in New Orleans, May 2, 3 and 4. The central theme of the convention will be "European Conditions as Relating to World Trade."

lengthened and new rigging fitted, as required. The after end of the boat deck is to be extended at sides and aft; "A" deck closed in, port and starboard, in way of main masts; steel deckhouses built in amidships, port and starboard; the after end of "A" deck, which was formed for depth bomb installation, to be rebuilt, including extension of docking bridge to original condition. There is also to be a new arrangement of derrick posts, booms and winches for handling cargo at the after wing ports to be installed, new canvas decks fitted, sections of new deck fitted, deck covering and tiling to be repaired, and some new to be laid.

The mechanical ventilating and heating system for passenger and crews quarters, as required where not now existing, to be installed, including motors, fans, thermo tanks, etc.; steam heat to be provided in crews' quarters and otherwise as required in accordance with the detailed specifications.

The present electric light wiring throughout the ships is to be removed down to switchboard and the ships rewired new throughout with new electric light fixtures provided, as required. The fresh water system and sanitary system are to be provided for and arranged to suit the new conditions; the communicating system, consisting of telephones and bell calls and a signal apparatus provided, as required.

The present steam windlass and steam hand steering gear are to be overhauled, and the ships are to be cleaned, scaled, painted and finished inside and out, and a sprinkling system provided, as required by the United States Steamboat Inspection Service.

MACHINERY DEPARTMENT

The propelling machinery, boilers, engine room auxiliaries and ice machine, are now and have been operating and no particular amount of work is contemplated in the machinery departments except minor work as covered in the detailed specifications, such as opening of boilers and turbines, grinding of valves, minor repairs and renewals, etc.

"ORIZABA" BOTTOM DAMAGE

In the case of this ship, following an inspection made in drydock by Lloyds' surveyors in August, 1922, after an alleged grounding in New York Bay, it was recommended at that time that permanent repairs to the bottom plating should be carried out, a summary of this damage being as follows: keel plates 9, 10, 11, 12, 16 and 17 indented; "A" strake 9, 10, 11, 12 and 13 indented; "B" strake 8, 9 and 10 indented; "C" strake 6 and 7 indented. It is understood that this particular damage is to be cared for under a separate contract.

PRINCIPAL WORK

Among the principal items mentioned in the specifications are the following:

Deep tanks, Nos. 9, 10, 11, between frames 57 and 65, are to be entirely removed and this space is to be restored to carry cargo with the necessary number of cofferdams. The eight deep wing tanks, Nos. 1, 2, 3, 4, 5, 6, 7 and 8, and double bottom tanks, Nos. 6, 7, 8 and 9 are to be fitted with coils around suction and heater grids in each of these tanks.

All steam and water pipes throughout the cargo and passenger spaces are to be removed and the new piping installed in accordance with detailed plans to be prepared by the contractor and approved by the owner's representative. A large amount of Lit-O-Silo is to be laid on the various decks.

THE "SIBONEY"

A similar amount of general reconditioning work is to be done on the *Siboney*, the principal items of which include the following:

The space between frames 95½ to 101 is to be cleared of berths, lockers, etc., and reconditioned as the crews' hospital, the equipment to include six metal berths. The boat deck is to be extended aft to frame 145 and carried for this length, including that portion from frame 130 to 140 to the sides of the ship.

The sides of "A" deck, from frame 130 to frame 153, are to be decked over to the sides of the ship, of the same construction as the present deck. To support this extension a steel girder is to run the full length of this portion of the deck, fastened to beams and supported by a steel tubular column resting on "C" deck, this column to be of sufficient strength to support the deck and four small booms for handling cargo, each about 17 feet long and about 3 tons' capacity.

On "A" deck the space between frames 44 to 62 is to be reconditioned and arranged for six passenger staterooms de luxe with adjoining bathrooms. While the space between frames 69 and 91, occupied at present by temporary staterooms, is to be cleared and reconditioned to form reading room, writing room and lounge.

On "A" deck, between frames 90 to 111, both sides, a new deckhouse extension is to be built each side of the main house, each of these houses to be fitted up with passenger staterooms, shower bath, etc.

On "B" deck the space between frames 42 and 52 is to be reconditioned to form suite, bedroom and bath, while that between frames 52 and 55 is to be reconditioned by installing new berths and fittings.

In addition to considerable other reconditioning work for the providing of passenger accommodations, the contract will call for the overhauling of the various mechanisms on both ships, the replacement of various systems, motors, galley equipment, etc.

Bids Asked for Construction of Semi-Diesel Electric Towboat

SEALED proposals will be received by U. S. Engineer Office, Nashville, Tenn., until 11 A. M., March 6, for the construction and delivery of one 80-foot semi-Diesel electric towboat. The vessel is to be delivered at Nashville, Tenn., and is to have a length overall of 98 feet 4 inches, length molded 80 feet, breadth molded 20 feet, depth molded 4 feet 6 inches.

MACHINERY

The main engine will be a multiple cylinder, 2-stroke cycle, heavy duty, semi-Diesel oil engine and is to be of American manufacture.

Agamemnon and Mount Vernon Committee Submits Recommendations

THAT extensive reconditioning contracts on the steamships *Agamemnon* and *Mount Vernon* are drawing materially nearer is indicated in latest information obtained by MARINE ENGINEERING AND SHIPPING AGE. It was announced in these columns on December 9, 1922, that a committee of prominent shipping men had made an investigation of the ships and preliminary estimates of the reconditioning cost were given out.

It was recently learned that the committee's report has been completed and forwarded to Washington and while no official statement could be obtained it is believed that these two great ships will be converted either into passenger ships or as seaplane carriers.

Reconditioning of the *Agamemnon* and the *Mount Vernon* as passenger ships would probably reach a total cost of close to \$5,000,000. No estimates could be obtained on their conversion as aeroplane carriers.

Bids for Reconditioning of America Due Early in March

ACCORDING to the latest information available, it is believed that plans and specifications for the reconditioning of the steamship *America* will be issued from the Shipping Board, 45 Broadway, New York, about March 2, bids to be received a week later. The contract will involve the expenditure of close to half a million dollars. It is understood that the ship will be placed in drydock in New York for necessary bottom work so that in the event of the contract being placed in another city the ship will proceed direct from New York Harbor.

The *America* has an overall length of 687 feet and it is expected that after her conversion she will be the largest cabin carrier in the world. Specifications will cover reconditioning of the hull and machinery, the rearrangement of present and installation of additional public rooms; overhauling the present, and wherever necessary, the installation of new systems such as ventilating, heating, electric, sanitary, etc.

New York and Porto Rico Line Ship Specifications Issued

PLANS and specifications for the construction of a passenger and cargo ship for the New York & Porto Rico Line have been issued from the office of Theodore E. Ferris, naval architect, 30 Church street. Bids will be received at that office until 12 o'clock noon, March 20, and it is believed the cost will be in excess of a million and a half dollars.

The proposed ship will have an overall length of 428 feet 3 inches; length between perpendiculars, 412 feet; beam, molded, 57 feet 6 inches; depth to hurricane deck at side, 36 feet 6 inches; designed load draft, 23 feet 6 inches; deadweight capacity at load draft, 4,250 long tons; speed at load draft, 15½ knots.

TYPE OF SHIP

The vessel will be of the three-deck, hurricane deck, coastwise type with fore-castle, deck well, bridge enclosure and continuous deck erections aft; complete double bottoms; lower, main, hurricane, promenade and boat decks, and two steel pole masts.

PROPULSION

The propelling machinery will consist of a Parsons design turbine engine, with reduction gears turning a single screw. At 87 revolutions per minute, the shaft horsepower will be about 5,800. Steam will be supplied by five Scotch boilers, equipped to burn oil for fuel.

EQUIPMENT

The steamer's accommodations will be sufficient for 305 first class passengers and 82 second class.

A separate price will be submitted by bidders for the installation of an air cooling

refrigerating and insulation system capable of cooling practically all of the ship's cargo space for the carrying of citrus fruits.

Annual Motor Boat Show Opened in New York

THE annual National Motor Boat Show, which is being held at the Grand Central Palace, New York, from February 21 to March 3, gives yachtsmen an opportunity to inspect a complete display of power driven craft, ranging from an eight-foot Kiddie Canoe to a sixty-foot ocean cruiser.

Several important meetings are scheduled in New York during the period of the show, including those of the United States Power Squadrons, the Waterway League of America, the American Power Boat Association, the Society of Automotive Engineers, the National Association of Engine and Boat Manufacturers, the International Power Boat Union and the Mississippi Valley Power Boat Association.

The show is held under the auspices of the National Association of Engine and Boat Manufacturers.

University of California Offers Instruction on Ships and Shipping

THE University of California Extension Division has organized class instruction in San Francisco, on ships and shipping. Charles F. Gross, assistant professor of marine engineering and naval architecture at the University, is the instructor of the first course along this line which has been attempted. Many prominent men in shipping circles have enrolled and the class recently organized already totals nearly 100.

The first course is an elementary one, and consists of ten 1½-hour lectures on such subjects as types and classification of merchant vessels, relations between different tonnages, stability, manning requirements, wages and duties of crews. The instruction will also include a brief description of marine power plants.

Plans are now being laid for more advanced courses on the completion of the present one covering ships and shipping.

British Naval Architects to Hold Annual Meeting March 21-23

THE annual meeting of the Institute of Naval Architects will be held on March 21, 22 and 23, in the Lecture Hall of the Royal United Service Institution, Whitehall, London, W. C. 2, with His Grace the Duke of Northumberland, C.B.E., M.V.O., president, in the chair. The annual dinner will be held on March 21 at 7:30 P. M. in the Grand Hall, Connaught Rooms, Great Queen street, Kingsway, London, W. C.

Electric Contract for Diesel Barges Goes to G. E. Co.

THE General Electric Company has been awarded a contract for the electric equipment to be used on the two Diesel-electric, self-propelled barges, which have been ordered by the Minnesota All-Water Transit Company, of Duluth, from the Great Lakes Engineering Works. The equipment of each barge will consist of two Lombard-Governor Diesel engines, directly connected to a 250-kilowatt, direct current generator, which in turn will supply electricity to drive two 250 horsepower motors, one attached to each of the twin screws. The motors are rated at 180 revolutions per minute, which will give the barges a speed of approximately eight knots.

The vessel will be controlled from the pilot house. They were designed by Henry Penon, of Cleveland, and will have a length of 254 feet and beam of 42 feet.

Navy Department in Need of Draftsmen for Small Boat Work

The United States Civil Service Commission announces an open competitive examination for ship draftsmen, Grade A (small boats). Vacancies in the Bureau of Construction and Repair, Navy Department, Washington, D. C., at \$6.80 to \$8.80 per month (plus bonus), and vacancies in positions requiring similar qualifications, at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

Appointees at annual compensation of \$2,000 or less, whose services are satisfactory, may be allowed the increase of \$20 a month granted by Congress.

Marine Examinations

The United States Civil Service Commission announces an open competitive examination for junior engineer and deck officer. Vacancies in the United States Coast and Geodetic Survey, at the entrance salary of

\$2,000 a year, and in positions requiring similar qualifications, at this or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion. Applications will be rated as received until June 30, 1923. Successful applicants will be notified.

Over Two and One-Half Million Dollars' Worth of Port Improvements Contemplated by New Orleans, La.

OVER two and one-half million dollars is expected to be spent for port improvement enterprises at New Orleans, La., in the near future, according to information obtained by MARINE ENGINEERING AND SHIPPING AGE. Pier work, freight sheds, dredging, etc., are among the projects under consideration.

Among other things, plans and specifications, which are waiting approval, provide for the construction of new wharves, sheds, etc., at the foot of Claiborne Street, at a cost estimated at \$1,800,000; for the renewing of about 400 lineal feet of wharves with steel structure freight sheds at the foot of Poland Street, to cost approximately \$275,000; and for the reconditioning and extension of sheds at the foot of Celeste

Street, which will cost close to \$200,000, and the foot of St. Joseph and St. Andrews Streets, at approximately the same cost for each location. Plans and specifications have also been prepared for enlarging of sheds and improvement of the sewerage and drainage systems at the foot of Canal Street.

These projects are under the jurisdiction of the Board of Port Commissioners who will receive sealed proposals at their office, Suite 200, New Court Building, until 3 P. M., February 1, for furnishing 50,000 cubic yards of sand, delivered at the Industrial Canal site, New Orleans, La.

The same office will open at 3 P. M., on February 1, tenders for furnishing and renewing woodwork for the 7th Street shed.

Bids Received on February 24 for Construction of Two Barges and a Steel Quarter Boat

BIDS were opened at 11 A. M., February 24, by United States Engineer Office, Wilmington, Del., for the construction and delivery of one steel quarter boat and two steel barges.

The quarter boat is to have a length of 80 feet, beam molded 26 feet, depth molded 5 feet, and is to be a 34-man vessel. The equipment for the vessel is to include a steam engine generating set, generator rated at three kilowatts, 110 volts, 700 revolutions per minute; fresh water pressure system, sanitary system, hot water pressure system and complete sets of plumbing fixtures of

heavy type Sands, Standard, Mott, or equal. A fire and bilge pump, 4½ inches by 5 inches by 6 inches, Davidson Simplex, or equal; and a sanitary pump, 5¼ inches by 5 inches by 6 inches, Worthington, or equal, are also to be installed.

The steel barges are to have a molded length of 60 feet, beam molded 22 feet, depth molded 4 feet. Each barge is to have two transverse watertight bulkheads and is to be fitted with four 7-inch cast iron bitts of approved design.

The quarter boat and barges are to be delivered afloat, at A and Poplar Streets, Wilmington, Del.

America's Foremost Shipping Men Address Propeller Club of the Port of New York at Noon-Day Luncheon

WHAT the Shipping Board is doing for the promotion of a successful American Merchant Marine was the theme of an address by Joseph E. Sheedy, vice-president of the Emergency Fleet Corporation, at a meeting of the Propeller Club of the Port of New York, on February 23. The results of the Board's policies, Mr. Sheedy stated, will be advantageous to American shipping, irrespective of the fate of the subsidy bill.

Commenting on the \$138,000,000 budget for the Board this year, Mr. Sheedy said that the principal items of expense for ship operation are as follows: fuel, 28 percent; stevedore and cargo handling, 23 percent; port charges, 10 percent; repairs, 12 percent and wages, 12 percent.

Other speakers included Stevenson Tay-

lor, president of the American Bureau of Shipping; R. D. Gatewood, director of the Division of Maintenance and Repairs, of the Shipping Board; Captain W. E. Griffith, operating manager; and Captain C. A. McAllister, vice-president of the American Bureau of Shipping.

All of the speakers spoke in high praise of the Propeller Club, the object of which is promotion of the "get-together" spirit, through informal luncheon meetings held twice a month. Its officers are:

W. Z. Gardner, president; J. Bonner, vice-president; H. W. Parsons, treasurer; B. L. Todd, secretary; Norris R. Sibley, of the London Steam Turbine Company, chairman membership committee; S. L. Lemon, of the W. A. Harriman Company, chairman executive committee.

Two Ferryboats Contemplated

THE Westchester Ferry Company, represented by the Mercury Shipping Company of 17 Battery Place, New York City, through Leo E. Schwarstein, is taking up with various shipyards the question of the construction of two ferryboats to run across the Hudson river in the vicinity of Yonkers.

Shipyard Expansion

The George T. Johnson & Sons' construction and repair yard, Cambridge, Md., is expanding its facilities through the installation of a new marine railway and various new machinery, having recently completed other improvements. The plant constructs yachts, lighters, barges and tugs and is at present building a twin screw houseboat for Charles V. Bossert, of Brooklyn, N. Y.

International Conference

The subject of "National Restrictions on Maritime Transportation" will be one of the topics discussed by group sessions at the second general meeting of the International Chamber of Commerce to be held in Rome, Italy, March 18 to 24. A. C. Bedford is chairman of the American committee and the American delegation headquarters will be at the Grand Hotel, Rome.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Barge Repairs, Philadelphia, Pa.—The damaged barge Theodore H. Rodhe was towed to Philadelphia for repairs.

Steamer Drydocked, Portland, Ore.—Steamer West Kents was awarded the Helser Iron Works for collision damage repairs.

Storm Damage Job, Winslow, Wash.—The storm-battered barkentine James Tuft was taken to Winslow, Bainbridge Island, for repairs.

Ship Drydocked, Mobile, Ala.—The tanker Mary Luckenbach has been placed on the dock at the Todd plant, Mobile, for overhauling.

Extensive Repairs, Baltimore, Md.—The H. E. Crook Company received the contract for extensive repairs to the Old Bay liner Alabama.

Repairs to Plates, Cleveland, O.—Steamer Quincy A. Shaw has been placed on No. 1 drydock, Cleveland, to have nineteen damaged plates repaired.

Steamer Reconditioned, Algiers, La.—The Shipping Board steamer West Hardaway has been placed on drydock at Algiers to be reconditioned.

Tanker Repairs, Mobile, Ala.—The Danish tanker Gedania has been placed on the drydock of the Alabama Dry Docks plant for considerable repair work.

Steamer Drydocked, Buffalo, N. Y.—Steamer Harvey D. Goulder was drydocked at Buffalo to have seventeen plates removed and thirteen faired in place.

Drydocking and Hull Cleaning, San Francisco, Cal.—The dreadnaught Arizona was taken to San Francisco to be drydocked and to have her hull cleaned.

Extensive Overhauling, Seattle, Wash.—The steamship Victoria, of the Alaska Steamship Company, has undergone an extensive overhauling and remodeling.

Engine Repairs, Chester, Pa.—The Squ Shipbuilding Company has been awarded repairs to main engine on the Vacuum Oil Company's motorship Brammell Point.

Reconditioning, Brooklyn, N. Y.—Steamer American Legion, of the Munson Line, was awarded to the Atlantic Basin yard, to be reconditioned at a cost of \$8,894.

Barge Overhauled, Galveston, Tex.—The whale-back barge Freeport Sulphur No. 4 was awarded to the Galveston Dry Dock & Construction Company to undergo an overhauling.

Motorboat Conversion, New Orleans, La.—The Johnson Dry Dock and Ship Repair plant has been awarded the contract to convert the gasoline motorboat Paul to a steamboat.

Tanker Contract, East Oakland, Cal.—The Hanlon Shipbuilding and Dry Dock Company was awarded repairs on the tanker Tutsum of the United States Shipping Board, at a price of \$688.20.

Contract Awarded, Galveston, Tex.—The Galveston Dry Dock & Construction Company was awarded the contract for repairs to the damaged steamer Schoodic, at a price of \$27,450.

Additional Vessels.—The Robert Dollar Company has purchased the British steamship Wayfarer, 15,000 deadweight tons, and the steamship Warszawa from the Polish Navigation Corporation.

Contract Awarded, Brooklyn, N. Y.—The contract for repairing the tanker H. M. Flagler, of the Standard Oil Company, was awarded the Morse Dry Dock & Repair Company, on a bid of \$11,841.

Tug Launched, Brooklyn, N. Y.—The first of three steel tugboats building for the New York

Central Railroad, Tug No. 30, was launched from the Tebo plant of the Todd Shipyards Corporation.

Yacht Reconditioning, New Bedford, Mass.—The seagoing yacht Harpoon, owned by Nathaniel O. Goode, is to be fitted with two high-powered inclined engines, Fayette type. Cost about \$100,000.

Low Bidders, Oakland, Cal.—The Moore Drydock Company was low bidder on a big general overhauling job on the engines and boilers of the Pacific Mail liner President Taft, with a price of \$18,865.

Repairs and Painting, Baltimore, Md.—The Baltimore Dry Dock Company has completed painting and repairs on the steamer Santa Rosa and has started work on the Shipping Board steamer Capulin.

Overhauling of Vessel, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was awarded the work of overhauling the Admiral Line steamer Senator, the work including refitting and changing of staterooms.

Cleaning and Painting, Portland, Ore.—The contract for repairs to the propeller and cleaning and painting the hull of the steamship Kentuckian has been awarded the Helser Iron Works, Portland, at a price of \$5,000.

Barkentine Damaged.—The five-masted barkentine Molfetta, which hit on a sand spit while sailing up the mouth of Pensacola harbor, Fla., was found to have been damaged, and has been dry-docked in Pensacola for repairs.

Oil Barge Construction, San Pedro, Cal.—The Associated Oil Company has awarded the contract for the construction of a steel oil barge to the Los Angeles Shipbuilding and Drydock Corporation, to cost approximately \$45,000.

Vessel Remodeling, Sparrows Point, Md.—Steamer Mary Weems, of the Baltimore & Carolina Steamship Company, will be reconditioned and remodeled at the Sparrows' Point plant of the Bethlehem Shipbuilding Corporation.

Tanker Launched, Chester, Pa.—The American tanker Pennsylvania Sun, built for the Sun Oil Company by the Sun Shipbuilding Company, Chester, has been launched. The ship is 480 feet long with a beam of sixty-five feet.

Barge Construction, Los Angeles, Cal.—The Los Angeles Shipbuilding & Drydock Corporation has been awarded the contract for the construction of a steel oil barge for the Associated Oil Company. Approximate cost, \$35,000.

Contract Awarded, East Oakland, Cal.—The Hanlon Shipbuilding and Drydock Company was awarded the steamer Stanley Dollar, recently purchased from the Robert Dollar Steamship Company by R. Chamberlain, for reconditioning.

Repairs to Steamer, Oakland, Cal.—The White Flyer Line steamer Humboldt was placed on the Moore drydock to undergo extensive reconditioning, work including rebuilding of hull and superstructure and installation of a new deck aft.

Repairs to Steamers, Baltimore, Md.—The Shipping Board awarded electric work on the steamer Winston-Salem to Mason & Roe at \$950, boiler work to the Pioneer Service Corporation at \$1,020, and machinery repairs to Theodore H. Rhode, Inc., at \$3,843.

Tug Launched, Brooklyn, N. Y.—New York Central Tug No. 31 was launched at the Tebo plant of the Todd Shipyards Corporation, this vessel being the second of three steel tugs constructed by the Todd Corporation. All are equipped with Todd oil burners.

Engines Supplied, Auburn, N. Y.—McIntosh and Seymour, of Auburn, N. Y., have been awarded the contract to supply the twin internal combustion engines of 600 horsepower, reversible Diesel type, for the Canadian Pacific ferry, to ply between Bellin-

ham and Vancouver Island, which is now being built by Yarrows of Esquimalt.

Overhauling of Steamship, New Orleans, La.—The steamship San Ramon, recently sold to the Donovan Lumber Company, of Aberdeen, Wash., by the New Orleans Coal and Bisso Towboat Company, has been overhauled and put in condition by her former owners.

Seagoing Vessels Contracted For, United States.—There were thirty-one seagoing steel vessels, having a total gross tonnage of 165,695, building and contracted for in the United States on January 1, 1923, according to statistics compiled by the American Bureau of Shipping.

Rivet Replacements, Oakland, Cal.—The Moore Drydock Company received the contract for making repairs to the damaged steamer Celtic Prince, which consisted largely of replacement of damaged rivets, the work being done by aid of divers 25 feet beneath the surface of the bay.

Radio Contracts, West Coast.—The Alaska Packers' Association is reported as having contracted with the Radio Corporation for the installation of radio sets on the ships Star of Russia, Star of Italy, Star of France, Arapahoe, the barks Edward Sewell, Star of Scotland, and the steamer Chilkat.

Chain Contract Award, Cleveland, O.—The National Malleable Castings Company has been awarded a contract for equipping five new 600-foot freighters now under construction at the Lorain Yard of the American Shipbuilding Company. Each boat will be equipped with two 90-fathom lengths of 2¼-inch Naco chain.

Miscellaneous Repairs, Mobile, Ala.—Steamship Bethlehem was placed on the dock of the Alabama Dry Dock & Shipbuilding Company for scraping and painting, after which she was moored at the Pinto north wharf of the plant where repairs to her steam lines, electrical system, fuel oil pumps and boiler room were completed.

Ferry Contracts, West Coast.—The contract for building two ferries for the Long-Bell Lumber Company has been awarded the St. Helens Shipbuilding Company. These ferries will operate between Longview, on the Washington side of the Columbia, and Ranier, Ore. The boats will be equipped with Diesel engines and will have a length of 120 feet.

Steamer Overhauled, Sparrows Point, Md.—The steamship Columbia, being overhauled by the Bethlehem Shipbuilding Corporation, at Sparrows Point, will be renamed the City of Atlanta, when she leaves the plant. The work included overhauling of engines and boilers, installation of a number of staterooms and bathrooms, and the whole re-decorated.

Steamer Launched, Lorain, O.—Steamer Joshua A. Hatfield, building for the Pittsburg Steamship Company, has been launched at the Lorain yard of the American Shipbuilding Company. The vessel is 600 feet over all, 580 feet keel, 60 feet beam, 32 feet deep. The steamer will have a triple expansion, reciprocating engine with cylinders 24½ by 41 by 65 inches, with 42-inch stroke.

Shipyard Activities, West Coast.—The Hanlon shipyards have delivered the army quartermaster's department water barge El Aguador, after installing a new wheel and drawing her tail shaft, as well as other repairs. The Standard Oil tanker Tachee was placed on Hunter's Point drydock to undergo the placing of a new rudder stock and to have her tail shaft drawn. The Pacific Mail liner Ecuador has been placed on the Bethlehem ways to have several of her bottom plates renewed.

Contracts Awarded, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company has received the following contracts: steamer Hancock County, to be fitted out for passenger accommodations and for repairing and refinishing of captain's and chief officers' rooms; Mexican steamship Santa Alicia, plate

work, bridge work, machinery jobs and repairs to entire wood deck; junior mine planter Major Albert G. Jenkins, cleaning, painting and minor repairs; and tug John W. McKie, installation of rudder and propeller, and miscellaneous repairs.

Contracts Awarded, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, of Mobile, Ala., was awarded the following contracts: installing of new tail shaft and wheel to steamship Yumuri, of the Ward Line; repairs to the Saugerties, of the Tampa Intercoastal Steamship Company; drydocking for inspection and repairs to the steamship Dirigo, of the Texas Company; fitting out cabins for additional passengers and other minor repairs to the steamship Lake Fairport and bottom calking, scraping and painting to the four-masted schooner Alpena.

Conversion, Brooklyn, N. Y.—With the conversion of the steamships Santa Marta and Zacapa, now at the plant of the Robins Dry Dock & Repair Company, the United Fruit Company will complete its program of converting all steamships, operating out of the Northern Division, from coal to fuel oil burners. The United Fruit Company's fleet, equipped for burning oil by the Todd Shipyards Corporation, includes the following vessels: Tolosa, Calamares, Pastores, Tivives, Carrillo, Metapan, Santa Marta, Zacapa, San Jose, San Mateo, Limon and Esparta.

Contract Awarded, Sparrows Point, Md.—The Bethlehem Shipbuilding Corporation, Sparrows Point, received the contract for the construction of two passenger steamers for the Eastern Steamship Lines, Inc., of Boston, Mass. Approximate total cost, \$3,800,000. Deliveries provided for April and May, 1924. Each vessel will have length overall of 402 feet, length between perpendiculars 385 feet, beam over guards 72 feet 6 inches, load draft 16 feet 6 inches. They will be twin screw, turbine driven, all burning, have a nominal speed of 17 knots and 6,310 tons displacement; night boats for service between New York and Boston, operating through the Cape Cod Canal.

PORT IMPROVEMENTS

Navigation, Etc., Orange, Tex.—\$750,000 has been voted by Orange County, Tex., for navigation improvements on Sabine River.

Ferry Docks, Windsor, Ont.—New docks are planned at Windsor by the Detroit Windsor Ferry company at a cost of \$500,000.

Electric Crane, Ogdensburg, N. Y.—The Hall Coal company is planning to replace the electric crane destroyed by storm last season. Price \$40,000.

Harbor Improvements, Houston, Tex.—Harris company and the City of Houston have voted \$4,000,000 bonds for harbor and dock improvements. C. McVea, city engineer.

Grain Elevator, Etc., Goderich, Ont.—Goderich Elevator & Transit Company, Horton street, London, is having plans prepared for a grain elevator, \$50,000, and also improving harbor \$250,000.

Grain Elevator, Burrard Inlet, B. C.—A grain elevator on 150 by 1,650 foot site, at Burrard Inlet, being planned by E. A. Woodward Grain Company, Ltd., 721 Grain Exchange, Winnipeg, Manitoba. Price \$500,000.

Grain Elevator, Duluth, Minn.—Occident Elevator company, Board of Trade Building, plans a 6-story, 0 by 250 foot grain elevator of reinforced concrete, on pile and concrete foundation, at Rices Point, to cost \$900,000.

Contemplated Improvements, New Orleans, La.—Over two and one-half million dollars is expected to be spent for port improvement enterprises at New Orleans, La., in the near future. Pier work, eight sheds, dredging, etc., are among the projects under consideration.

Grain Elevator, Ft. William, Ont.—James Stewart Grain Company had plans prepared for a 1,500,000 bushel terminal grain elevator, concrete, \$850,000. The pile foundation was awarded to the Thunder Bay Harbor Improvement Company, Molsons Bank Building, Port Arthur, at \$150,000.

Pier, San Diego, Cal.—The United Dredging Company, foot of Beech street, was awarded the contract for 305,000 cubic yards of dredging at \$0.295 per cubic yard, 12,000 ton rock fill at \$2.70, constructing curtain walls, etc., at \$87,525, by the Common Council constructing first unit of mole type No. 2.

Excavation, Fort Pierce, Fla.—Excavation in the North St. Lucie river drainage district, during the month of December, totaled 206,772 yards, according to the monthly report of operations. This brings the total excavation up to nearly four million yards, or about two-thirds of the total project, which it is estimated will be completed in another year. The monthly excavation in the district is again approaching normal, after several months of hindrance on account of high water.

Drainage Projects, Tallahassee, Fla.—Five new drainage projects, contemplated by the Everglades drainage board for the coming year, have been approved, it was announced by F. C. Elliott, chief engineer of the board, upon his recent return to the capital from South Florida. They include construction of an intercepting canal, at a point fourteen miles south of Lake Okechobee, east of Hillsboro and North New River canals; and construction of levees on the West Palm Beach and Miami and South New River canals.

GOVERNMENT WORK

Dredging, New York, N. Y.—U. S. Engineer, 1st District, plans dredging at Flushing Bay.

Dredging, New York, N. Y.—U. S. Engineer, 2nd District, plans to dredge in Shrewsbury River.

Waterway Dredging, Galveston, Tex.—U. S. Engineer, Galveston, plans dredging Sabine-Neches Waterway.

Dredging, Providence, R. I.—U. S. Engineer, Providence, plans maintenance dredging in Connecticut River.

Harbor Improvement, New Orleans, La.—U. S. Engineer, 329 Custom House, plans to dredge Intercoastal Waterway, near Houma.

Derrick Boats, Etc., Nashville, Tenn.—U. S. Engineer is planning to purchase 2 steel derrick boats and 9 barges for revetment work.

Maneuver Boat, Savannah, Ga.—U. S. Engineer Office, plans to purchase a maneuver boat for Dam 30, Ohio River, also plans repairs to dredge Macon.

Dredging, San Diego, Cal.—United Dredging Company, Exposition Park, Los Angeles, received the contract for dredging in San Diego Harbor. Price \$103,876.

Rip-rapping Diike, Mare Island, Cal.—Specification 4775—Bureau of Yards & Docks, Navy Department, Washington, D. C., is planning rip-rapping dike, Mare Island.

Pier, Etc., Boston, Mass.—Specification 4778—Bureau of Yards & Docks, Navy Department, Washington, D. C., plans fuel oil pier, bulkhead and dredging, at Boston.

Reconstructing Dikes, Mare Island, Cal.—Specification 4776—Bureau of Yards & Docks, Navy Department, Washington, D. C., plans reconstructing dikes 9 and 14, Mare Island.

Barges, Milwaukee, Wis.—U. S. Engineer, Federal Building, awarded contract for five barges and installation of machinery in same, to Greenbay Dry Dock Company, Greenbay, Wis., at \$72,400.

Crane, Washington, D. C.—The Chief of Engineers Office, 250 Old Land Office Building, has awarded the contract for one steam locomotive crane to McMyler-Interstate Company, Bedford, O. Price \$5,870.

Lock Gates, Pittsburgh, Pa.—John Eichleay, Jr., Co., 45 South Twentieth street, was awarded the contract by the U. S. Engineer, Pittsburgh, for steel lock gates for Lock 1, Allegheny River, at a price of \$7,371.

Excavating, Wilmington, Del.—The Delaware Dredging Company, 139 South Third street, Philadelphia, Pa., was awarded the work of excavating cut-offs in St. Jones and Mispillion Rivers, by U. S. Engineer. Price \$45,632.

Contract Awarded, Buffalo, N. Y.—The American Construction Company, Marion Building, Cleveland, Ohio, was awarded the contract for constructing a stone and concrete superstructure on breakwater in Buffalo Harbor, at a price of \$447,609.

Pier Extension, Puget Sound, Wash.—Specification 4707—Bureau of Yards and Docks, Navy Department, Washington, D. C., awarded a contract to Henry & McFee, 208 Northern Life Building, Seattle, for extension to pier, Puget Sound, at a price of \$395,173.

NEW INCORPORATIONS

Great Central Forward Company, of New York, capital \$12,000, chartered under Delaware laws.

The New York Port Terminal Company, capital \$1,000,000, to build docks, chartered under Delaware laws.

Fort Myers Steamship Company, Fort Myers, Fla., capital \$100,000. President, I. W. Riggs; secretary and treasurer, Harry Botts.

The Canadian-American Bureau of Trade, of Manhattan, shipping agents, capital \$20,000, chartered at Albany. Incorporators: E. B. Beacham, D. W. Harris and T. R. Fleming.

Polarus Shipping Company, ship brokers, capital \$125,000, incorporated under Delaware laws. Incorporators: Captain T. N. Agapeyeff, Marcel Levy and Charles Dunaif, of New York.

Porto Rican American Steamship Corporation, capital \$2,000,000, to do business in coal and timber, chartered in Delaware. Incorporators: Wm. H. Stayton, Sr., Wm. H. Stayton, Jr., and Arthur J. J. Townsend, of Baltimore.

FOREIGN ACTIVITIES

Shipyards Reopened, Ireland.—After having been closed for some months, the yard of the North of Ireland Shipbuilding Company, Ltd., Londonderry, has been reopened.

Contract Placed, Belfast, Ireland.—An order has been placed with Workman, Clark & Company, Ltd., Belfast, for the construction of a large passenger and cargo steamer for the Eastern trade.

New Vessel, Scotland.—The Ailsa Shipbuilding Company, Ltd., Troon, has received an order from Messrs. William Sloan & Company for the construction of two steamers, each of about 1,130 tons gross, similar to the Findhorn and the Annan, built at Troon for the same owners in 1903 and 1907, respectively.

Tonnage Output, British Company.—The Shipyards of Swan, Hunter & Wigham Richardson, Ltd., show a tonnage output during 1922 of 119,652 tons. This figure includes only ships launched on the Tyne and at yards on the Wear, on the Clyde and in Ireland, exclusively owned by the firm, and is the largest output of any British shipbuilding company.

New Steamer, Italy.—The steamer Laura, built at Cantiere Navale Triestina di Navigazione, has been successfully launched. She has a gross tonnage of 6,131; net tonnage of 3,718; length of 127.44 meters; breadth, 16.47 meters; draught, 10 meters. The vessel has engines of 2,200 horsepower, which will give a speed of 10½ nautical miles per hour.

Spanish Steamer Trials.—Having passed successful trials, the light cruiser Reina Victoria Eugenia, built at Ferrol Dockyard, has been handed over to the Spanish Government. She displaces 5,590 tons, is 462 feet long overall, 50 feet beam, 15 feet 9 inches mean draft, and has a speed of 26 knots. She has twelve Yarrow type coal-fired boilers, and her Parsons turbines develop 25,500 shaft horsepower, on two shafts.

Vessel Construction for Sweden.—According to announcement by the Swedish-American Steamship Line, which operates a fleet of passenger and freight vessels between New York and Gothenburg, an order is to be placed in a British yard for a new 16,000 gross ton liner. The ship will be 580 feet long with a 70-foot beam, and will accommodate 100 first, 400 second, and 1,000 third-class passengers. Delivery, 1924.

Contracts Placed, Rotterdam, Holland.—C. Van Der Giessen & Zonen's Scheepswerven, of Rotterdam, have received the following contracts. One motor vessel for river trade, to carry passengers and cattle, for Dutch owners, having a Bolnes 4-cylinder motor of 260 horsepower, the boat being 148 feet by 23 feet by 8 feet; and a shelter deck cargo steamer of 6,600 tons deadweight, for Dutch owners, having triple expansion engines furnished by Rotterdam Drydock Company, the vessel being 360 feet 6 inches by 50 feet by 32 feet 6 inches.

Progress Being Made on \$3,000,000 Port Development

NORFOLK, Va., January 25.—Work on the new \$3,000,000 coal pier of the Virginia railway, for which contracts were awarded two months ago on which construction was immediately started, has made substantial progress.

Sanford & Brooks have been engaged in piling for the pier and in building a bulkhead since the week after the contracts were let. The bulkhead is now about three-fourths finished.

TRADE PUBLICATIONS

AIR FILTERS.—A new edition of the Midwest Steel and Supply Company (New York) catalog, covering the apparatus made by this company for handling dirt and dust problems, and air filtration for industrial plants, will be distributed within a short time.

BOILER CAPACITY.—A folder outlining three features of Heine boilers—economy, flexibility and capacity—has been distributed by the Heine Boiler Company, St. Louis, Mo. An installation of oil-fired Heine boilers, in which these features accomplish excellent results in cutting down cost, is given as a notable example.

INDUSTRIAL LIGHTING.—A new series of six bulletins on systems of lighting for various industrial uses has been issued by the Edison Lamp Works of the General Electric Company, Harrison, N. J. These bulletins cover the lighting of textile mills, pulp mills, woodworking plants, street lighting and the like. Former issues of lighting bulletins have been revised and brought up to date and may be obtained upon request.

CONICAL MILLS.—Conical ball and pebble mills and their application to the field of grinding and pulverizing are described in catalog No. 13 issued by the Hardinge Company, New York. The various methods of grinding for metallurgical purposes, the manufacture of cement, and in the fuel field are taken up in detail with an illustrated description of the construction of Hardinge mills and their applications. Specifications and applications of these mills are included in the bulletin.

SEAMLESS BOILER TUBES.—The manufacture, properties and uses of "Shelby" seamless hot rolled boiler tubes are detailed in Bulletin No. 12 of the National Tube Company, Pittsburgh, Pa. One of the most important uses for seamless steel tubing is in boilers and until late years cold drawn tubes were found more satisfactory than those made by other processes. However, the process of hot rolling has been so far developed that tubes made by this process are becoming more generally used. Tables of properties of "Shelby" tubes and other useful data are contained in the Bulletin.

PUMPS AND GEARS.—The Waterbury hydraulic variable speed gear, as applied to ship's deck auxiliaries and the Waterbury variable delivery pump used for ship's steering gears are illustrated and described in bulletins sent out by the Waterbury Tube Company, Waterbury, Conn. In driving winches, capstans, windlasses and other deck machinery where electricity is available, the introduction of the Waterbury speed gear

between the motor and driving gear enables extreme flexibility. The electro hydraulic steering gear combines the advantages of the hydraulic steering gear with the efficiency and adaptability of electricity as a power source.

PIPE PRODUCTS.—The products of the Whitlock Coil Pipe Company, Hartford, Conn., consisting of apparatus formed from pipe and tubing, or parts so formed, are described in a conveniently referenced pamphlet issued by this company. The products are divided into four classes—bent and welded piping for high pressure steam and fluids, coils of pipe and tubing which are made continuous by welding or brazing together the required number of pieces, welded receivers for storing fluids under high pressure and tubular heat exchanging devices including many types of heaters and coolers for different purposes.

CENTRIFUGAL PUMPS.—Small single stage centrifugal pumps for motor or belt drive are described in a bulletin and an instruction manual issued by the De Laval Steam Turbine Company, Trenton, N. J. These pumps are made in 1½-inch and 2-inch sizes and are designed for capacities ranging from 5 gallons per minute against a 10-foot head up to 130 gallons per minute against a head of 150 feet. The bulletin contains complete tables and instructions for selecting pumps to meet different conditions and also explains methods of determining the proper speeds, the manner of selecting piping, valves, fittings and the most desirable type of drive, either pulley or motor, in order to secure an efficient and satisfactory installation.

FUEL OIL BURNERS.—The Morse fuel oil burning system and the combustion engineering service of the Morse Dry Dock and Repair Company, Brooklyn, N. Y., are detailed in a well illustrated catalog recently issued. By means of an outline of the work of the designers, D. J. Irish, and the advisory engineering staff of combustion specialists, together with the drawings and photographs showing the actual construction of the system, an excellent idea of the system and the efficiency obtained by its use are given. In addition, the permanent follow-up service which is provided with each installation insures the best results with this equipment in operation. For convenient reference there are included valuable tables relating to oil burning and boiler products.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson,
U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York.
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City.
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York
President—E. A. Simmons.
Secretary—Robert B. Lea.

The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irving G. Keller.

Port of New York Authority

11 Broadway, New York.
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—H. H. Raymond.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morrison,
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

April, 1923

Number 4

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY
Woolworth Building, New York

F. B. WEBSTER, Editor
H. H. BROWN, Managing Editor

L. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

Contributing Editors

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WE GUARANTEE that of this issue, 4,900 copies were printed; that of these copies 3,916 were mailed to regular paid subscribers, 389 were provided for counter and news company sales, 193 were mailed to advertisers, 31 were mailed to employees and correspondents and 371 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 21,600, an average of 5,400 copies a month.

MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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Defeating Its Own Object

THE award of the contract for the reconditioning of the *America* to the Brooklyn Navy Yard is so unfair to the repair plants that we are even able to quote no less a personage than the Honorable Edwin Denby, Secretary of the Navy, as decidedly opposed to such a practice. Secretary Denby in a letter to the *New York American* under date of November 8, 1921, in reference to the efforts of a certain Congressman from the State of Massachusetts to secure the job of reconditioning the *Leviathan* for the Boston Navy Yard said:

"A bid by a private firm is a guaranty of the performance of the work at a price named and within a time stipulated.

"A bid from a navy yard is the estimated cost of the work. If work is awarded a navy yard after an estimate, the actual cost of the work is charged, whether the same be greater than or less than the estimated cost. Estimates ordinarily run fairly close, say within about 10 percent; but in a big reconditioning job where the actual amount of work necessary can only be revealed after opening up the work and uncovering all defects, it is difficult to make an estimate that will fall within 10 percent of the actual cost.

"Furthermore, the stipulated time for performance of work for other departments of the Government must always be subject to the condition that urgent naval work shall take pre-

cedence even if such precedence causes failure to perform the other Government department's work within the time stipulated.

"As the total cost of reconditioning the *Leviathan* will probably run somewhere between six and eight million dollars, it will be seen that an estimate submitted by a navy yard would not give the Shipping Board the exact information which they desire as to cost and time of performance of this work. The necessity for economy is so great that the authorities of the Shipping Board do not feel that they could take the chance of overrunning the estimated cost by five or six hundred thousand dollars. They must have a guaranteed total expenditure."

As a comment on Secretary Denby's letter we might show many cases where the estimates on various repair jobs approach differences reaching far nearer 100 than 10 percent but taking his own figures that the navy estimate might easily be 10 percent under the actual cost we should like to point out in the case of the *America* that the guaranteed price of the Morse Dry Dock and Repair Company was less than 7 percent in excess of the navy yard estimate.

This award is a severe blow to the repair plants not only in the case of this one ship but in the precedent that it sets for the reconditioning of other vessels that have been authorized by the Shipping Board. The avowed policy of the board is to seek the advice and cooperation of private shipping interests and eventually dispose of its fleet, under the mandate of the Jones Act, to private capital. How is it going to accomplish this purpose, if the Government sets itself up in competition with the very interests that it seeks to foster?

Evaporators Versus Deadweight

THE savings that can be obtained by the use of an efficient evaporator system on shipboard, as explained by Professor Chapman in his article on page 197 of this issue, are startling to say the least. As his calculations are based on a full deadweight rather than a measurement cargo or, in other words, on voyages where every ton of reserve fresh water displaces a ton of paying freight, it should be noted that his figures do not equally apply to partially loaded ships.

However, as most vessels constantly seek full deadweight cargoes and often obtain them, the question arises as to why evaporators are used only to a very small extent on merchant ships today. We find from Professor Chapman's figures that a saving of \$39,360 per annum with a double evaporator

system and a saving of \$35,600 with a single evaporator system is possible on a 10,000-ton deadweight cargo vessel. It is interesting to note that this one saving is at least twice the amount that such a vessel would have received in subsidy under the Merchant Marine Act of 1922 had that measure become a law.

A still more striking comparison is furnished by the total yearly fuel oil bill for the same ship under the same conditions as published in an article on stevedoring costs in the February issue of this magazine. The annual fuel bill is given as \$72,500, so, if the owner can save \$39,360—54 percent of this cost—or over 100 percent of the fuel bill of an equivalent motorship through increased freight revenue by the use of evaporators, then it is time to inquire whether there should not be some one in the steamship organization whose particular function it is to see that a small saving in one department, such as the fuel consumed in operating an evaporator, is not more than overbalanced by a large loss in some other department.

Is it not the solution in this case that the engineer is not interested in operating evaporators which require considerable attention and apparently add to the cost of the engineering department? We say "apparently" for there are several other gains and advantages which may be credited to evaporators that affect engine room economy. Among these items may be mentioned pure feed water, elimination of boiler scale, increase in rate of boiler evaporation, less boiler blow losses and increased temperature of feed water. Surely this subject is worthy of investigation by shipowners who are not depending on the Government to pay their bills.

The Agamemnon and Mt. Vernon

THE decision of the Shipping Board to authorize the reconditioning of the *Agamemnon* and *Mt. Vernon* marks an epoch in the development of our merchant marine, for it assures us a North Atlantic passenger service equal to that of the Cunard and White Star Lines. And this is not all for the country-wide facilities that a liner company employs to solicit passenger trade are also available for obtaining freight and it may therefore be expected that the successful operation of the United States Lines will find employment for freighters to supplement its passenger vessels.

As we have pointed out many times before, the *Leviathan* could maintain only a one-way express passenger service. At least three fast vessels are needed to insure a regular schedule and the only ships that are both available and capable of making 23 knots are the *Agamemnon* and *Mt. Vernon*.

What is more, the Shipping Board has no authority to construct new vessels, an undertaking that would require several years. They can, however, by adding the *Agamemnon* and *Mount Vernon* to the fleet of the United States Lines greatly increase the probabilities of disposing of the entire line to a private enterprise. The reconditioned vessels would serve their purpose for several years and so make it possible through the development of business to construct new steamers of even a more modern type than any that exist today.

A year ago last January we published an analysis by Carl

E. Petersen, naval architect of the United States Lines, showing exactly what might be expected from these vessels in the way of financial returns. In this analysis revenues were estimated at a minimum and expenditures at a maximum and still the balance per annum after deducting expenditures and capital charges was found to be \$1,048,000 for the *Agamemnon* and \$1,298,000 for the *Mt. Vernon*.

These ships as well as the *Leviathan* should have been reconditioned long ago not only because they would have by this time paid back a large part of their reconditioning costs but also, and of more importance, because their presence in active service would have had a great moral effect in favor of our merchant marine on the American people.

The strength of our position in cargo carrying tonnage is still a long way in advance of our passenger carrying trade. "It seems safe to forecast," said Mr. E. H. Rigg, in his paper before the Society of Naval Architects and Marine Engineers in 1921, "that passenger ship construction will figure somewhat prominently in our bigger and best equipped yards during the next few years, particularly when it is remembered that a considerable number of ships now running would, but for the war, have been out of service ere this and they will need replacement just as soon as practicable." We believe that many shipowners have delayed action pending the determination of a definite Government policy and that the work just authorized on the *Agamemnon* and *Mt. Vernon* is significant as an indication that the time to balance our fleet of cargo vessels with the necessary passenger ships has arrived.

Definite Shipping Policy Still Under Consideration

THE failure of the ship subsidy bill, because of the antiquated rules governing debate in the United States Senate which left a majority of that body impotent in the face of a filibuster by a determined minority, apparently has left the Shipping Board and the administration without a definite policy for transferring the Government fleet to private interests, although one is promised in a few weeks. Probably it is just as well that the board has decided not to act too precipitately in view of the fact that the amount of available tonnage is now such that the recent increase in the export and import business can not be depended upon to maintain the present improvement which has taken place in the rate situation.

After it had become apparent that the bill was dead, Chairman Lasker of the Shipping Board had announced that a "novel and startling" plan for the disposition of the fleet would be made public in a few days and it had been officially stated at the White House that the policy of liquidation would be in effect long before the next Congress meets next December. Before the President and chairman left for Florida on March 5, however, some change occurred which led to an announcement that a committee of the board, consisting of Commissioners Lissner, Thompson and Chamberlain, had been appointed to study and prepare detailed plans "with a view to bringing about, without interruption of service, the passage of the Government's lines into private ownership, in so far as possible." Another committee, consisting of Vice-Chairman O'Connor and Commissioners

Benson and Plummer, is to make a survey of the physical condition of the fleet as a whole. The President and Chairman Lasker are also reported to be giving some consideration to matters of general policy while on their vacation trip in Florida.

In a general way, three courses are open. The first, continued Government operation of the ships until conditions become such that private shipping interests will be "glad to take them off the Government's hands," was about the only alternative suggested by the opponents of the subsidy bill. They ignored the fact that the present fleet is not properly balanced and would require additional investment as well as heavy expenditures for renewals, to maintain it as a going concern, while its competition would tend to prevent the development of private shipping. Such a plan is not regarded with any favor by the administration, which has no desire to continue to stand the losses inevitably connected with such operation. A second theory is that since the matured policy on which the administration has staked its efforts has failed, the Government should proceed to get rid of its white elephant as speedily as possible. The third, which seems to be the one on which the board is now working, lies between the first two. While representing no commitment to a policy of Government operation, it recognizes that it will be practically impossible for the board to liquidate in any short time and that many months, if not some years, will elapse before the Government is actually out of the business of owning and operating ships.

The Jones merchant marine act directs the sale of the ships only "as soon as practicable, consistent with good business methods and the objects and purposes to be obtained by this act." Also it requires the board to take into consideration conditions that would influence a prudent business man in the sale of property "which he is not forced to sell." It may be that Chairman Lasker's "startling" plan was the result of an impression that he was "forced to sell" but that more deliberation suggested other considerations, such as the necessity of maintaining present services and of properly balancing existing fleets before an attempt is made to sell them. It is hoped that new shipping companies will be organized to take some of the services now being operated under MO-4 contracts, but President Smull of the Emergency Fleet Corporation says that no attempt will be made to sell any of the vessels of the fleet now operated by the United States Lines singly until the fleet has been built up to the point of balance regarded by the board as necessary by the addition of the *Agamemnon*, *Mt. Vernon* and *President Buchanan*, and also the *Leviathan*, now in process of reconditioning. The *Leviathan* will be ready for service this season but work on the other vessels cannot be completed in time for use this season.

It is believed that at least 300 of the 346 steel cargo and passenger vessels now being operated in the berths established by the board will be needed to keep up the services on these routes and that when the board's policy has been definitely outlined an effort will be made to sell these ships which constitute the cream of the fleet, but it may be that further legislation will be considered necessary to make more attractive the terms upon which the ships can be sold or possibly to remove some of the present laws which restrict their success-

ful operation. Even after the detailed plan is announced a good deal of time would necessarily be required actually to complete the negotiations. At the basic rate of \$30 a ton comparatively few ships have been sold and the question as to how much below this figure the board would feel justified in going is one of the difficult problems before it.

The board has 320 lake-type ships, under 4,200 dead-weight tons, which are suitable for coastwise service and some of these may be sold to foreigners because they can not compete successfully with American ships in foreign trade. Conditions in the oil business may be such as to enable an early disposition of the 80 tankers owned by the board, and there are some 221 steel cargo vessels now tied up which are regarded as suitable for economical operation and salable, if there should be a demand for tonnage, but it is probable that some 400 of the board's ships will be classed as fit only to be scrapped.

The Situation

THE defeat of the ship subsidy bill has not turned out to be such a body blow as many of us expected. Both shipping and shipbuilding prospects are brighter than they have been at any time since the depression started in the fall of 1920. In shipping, the demand for coal, particularly from Germany where substantial contracts have already been placed covering the next three months, has resulted in an advance in freight rates and still further advances are almost certain to occur until additional vessels are sent here from abroad or more of our own vessels are placed in commission. Several coal cargoes have also been fixed for Italy and a few for South America which has also helped to give a much firmer tone to the market.

Passing to the grain market, we can derive considerable satisfaction from the fact that Congress did provide means to finance the farmers and these credits are bound to have a very favorable effect on shipping. We have enormous supplies of grain in this country which can undoubtedly be shipped abroad, if credits can be arranged. It is apparent that a brisk demand for grain would at least maintain if not advance the rates that the recent demand for coal has created.

In this connection we should not lose sight of the growing tendency to ship grain through the port of Montreal whenever that harbor is not blocked by ice. Canadian wheat would naturally pass through a Canadian port but, if the shippers of Montreal get control of the grain market by handling both American and Canadian wheat, they are bound to favor their own farmers whenever possible. Such opportunities actually have occurred; for instance, great quantities of wheat were shipped from Canada through the port of New York in bond during the month of March while our own elevators, and this is particularly true of Buffalo, were stocked to the overflowing point. Probably the tariff on wheat has a great deal to do with this condition as it is but natural for nations to retaliate against any obstructions to the free flow of commerce.

Nor does it appear that the fate of the subsidy bill has discouraged shipbuilding any more than it has shipping. Significant in this respect is the recent report of the Atlantic

Coast Shipbuilders' Association which gives a total of \$5,000,000 as the amount of work contracted for during the months of January and February. In addition to this, the report is authority for the statement that additional orders are in sight that will bring the total up to \$15,000,000 by the first of May.

Confirming to a large extent the encouraging viewpoint of the Shipbuilders' Association is the recent statement of the Bureau of Navigation of the Department of Commerce which reports a total of 302,047 gross tons now under construction as compared with 251,858 gross tons on January 1. But by far the most encouraging prospects of the near future lie in the authorized and pending contracts for conversion, repairs and reconditioning. Chief among the new contracts whose consummation has been authorized are the reconditioning of the *America*, *Agamemnon*, *Mt. Vernon* and *President Buchanan*. These vessels not only have a direct bearing on the welfare of our shipyards and repair plants but they also will have a tremendous influence on developing and maintaining a first class transatlantic American passenger service.

While on the subject of conversion and reconditioning we would like to call attention to a project on which Admiral Benson is working; namely, the conversion of idle Shipping Board vessels to motorships. Many of these vessels, as is well known, have good hulls but inefficient machinery installations. They are worthless as they are and we have every reason to believe that the Shipping Board will dispose of them—on condition that Diesel engines are installed—at prices that will make it possible to procure motorships in this country cheaper than they may be obtained in any other country in the world.

Diesel engines have proven their reliability and they stand in a class by themselves not as slightly more economical than a steam installation but, according to conservative estimates, they consume only from one-third to one-half the amount of fuel that the most efficient steamer will use. Many authorities think it a crime to use oil under boilers and there is little doubt but that the fixed charges on the additional cost of a motorship over a steamer is the main reason why this type of vessel has not been developed in this country as it has and is now being brought to the front in foreign maritime nations. We believe Admiral Benson is working on the right lines and that the elimination of this differential in first cost through the sale of Shipping Board vessels at nominal figures will stimulate the conversion of a large number of steamers to motorships.

The outstanding feature in new construction during the past year has been the building of coastwise passenger vessels. While a number of these contracts have been awarded nevertheless it is still a fact that the average age of our coastwise passenger ships is still much greater than either the demands of economical operation or the comfort of passengers would permit, if foreign competition were allowed. Of course the replacement of these vessels must occur sooner or later and it is our belief that delay in doing so is principally caused by the mistaken idea that cheaper contracts can be obtained in the future.

No one would contend that shipyards could go on indefinitely taking contracts at ruinous figures but owners

usually are reluctant to place new work until prices have shown an upward trend. Such information as has recently been given out by the American Steamship Owners' Association that the idle privately owned American tonnage has been reduced to 10 percent, as well as the common knowledge that the world's idle tonnage has been reduced by 2,000,000 tons in the last year, coupled with the demand that the partial failure of the Mexican oil fields has caused for tankers, the lack of passenger and refrigerator ships and the phenomenal growth of our coastwise trade ought to convince shipowners, particularly in view of the rising market in all commodities, that delay in replacement is bound to be a losing policy.

The shelving of the subsidy bill does not mean that American ships are to be left without Government aid. Chairman Lasker in a recent statement to the press called attention to the fact that the Jones Bill is still operative. And further the declaration in that measure that the Government is in favor of doing what it can to encourage the development of an adequate privately owned merchant marine is by no means idle talk.

As a matter of fact, the Government is in a position without further legislation to grant in many cases what amounts to very substantial virtual subsidies. We refer in particular to advantageous contracts with operators, loans for the construction of vessels with low interest charges, preferential railroad rates to goods shipped in American bottoms, sale of ships at such low figures that the fixed capital charges are practically eliminated, transportation of army and navy supplies and personnel on privately owned vessels, employment of a liberal policy of payment for carriage of mails, which is fully authorized by the Act of 1891, co-operation with the Bureau of Foreign and Domestic Commerce, commercial attachés and utilization of other Government functions, adoption of a uniform bill of lading, establishment of foreign trade zones, establishment of local agencies throughout the country similar to those maintained by railroads and, if possible, the making of arrangements with the railroads for connecting rail and water transportation and many other items, not to mention the use of the same ingenuity and efficient organization that is displayed in other American industries.

We are told that the Shipping Board is now at work preparing detailed plans with a view of bringing about, without interruption of service, the passage of Government lines to private ownership in so far as possible. In the meantime our sailors have been officially advised that the board will continue to operate all of its lines and that it is their duty to carry on in a manner which will make for confidence, efficiency and stability.

The important part of Commissioner O'Connor's message to the seamen, however, was also recently expressed by Mr. Frank C. Munson, president of the Munson Steamship Lines. It is the statement that the American public are actually becoming interested. They are increasing their patronage of American vessels and they are carrying back with them to the inland states a story of wonderful achievement and efficient service. Efficient operation and management we must all acknowledge are of far greater importance to shipowners than any patronage that the Government might bestow.

Does an Annual Saving of \$40,000 Interest You?

Analysis Shows Evaporators Can Save Half of Fuel Bill on Steamers Under Full Deadweight Conditions

By Lawrence B. Chapman*

EVAPORATORS are used only to a very small extent today on merchant ships for producing make-up feed and water for culinary purposes. The common practice is to carry make-up feed in the double bottom tanks; and when evaporators are actually fitted they are, as a rule, used only in emergencies or to supplement the supply of water from the tanks.

Under present trade conditions where most of the cargo ships are sailing with only partial cargoes, or for ships that carry cubic cargoes and are not loaded to the draft marks, the conditions mentioned above are probably economically sound. However, when trade conditions are such that full cargoes can be secured there is a distinct advantage in using evaporators instead of carrying make-up feed as will be shown in this article.

TYPES OF EVAPORATORS

There are a number of methods in use of operating evaporators on shipboard as follows:

1. One evaporator (single effect) using high pressure steam.

(a) Vapor from evaporator shell to main or auxiliary condenser.

(b) Vapor to distiller and distillate to hot well or tanks.

2. Two evaporators (double effect) using high pressure steam to the coils of the first effect evaporator. The evaporators are operated in series, the vapor from the first effect shell goes to the coils of the second effect evaporator where its latent heat is used in evaporating more water.

(a) Vapor from second effect shell to condenser.

(b) Vapor from second effect shell to distiller.

3. Double effect as in No. 2 but fitted with evaporator feed heater. The vapor from the second effect shell goes to feed heater where its latent heat is used in heating the evaporator feed (see Fig. 1). A distiller is seldom used with this arrangement; the condensate from the heater passes directly to feed tank—through a steam trap.

4. Double effect (low pressure type) using low pressure steam (auxiliary exhaust) in the first effect coils. A low vacuum is maintained in the second effect shell and a distiller condenser and air pumps are used.

5. Triple and quadruple effect evaporators.

Generally of the low pressure type.

Of the various arrangements mentioned above the first arrangement, consisting of one evaporator without evaporator feed water heater, is the general practice when evaporators are installed in the merchant service. The fourth and fifth arrangements are used in the Navy, where large quantities of low pressure auxiliary exhaust steam are available. These last two types are not to be recommended for merchant vessels because of their complications.

OPERATION OF DOUBLE EFFECT TYPE

Arrangement No. 3 should be used on merchant ships instead of the simple single effect evaporator. This type can be operated nearly as easily as the single effect type and the gain in economy is marked. Fig. 1 shows a diagrammatic arrangement of a double effect evaporator with feed heater.

Referring to Fig. 1, the high pressure steam at about 95 pounds absolute enters the coils of the first effect evaporator and evaporates salt water in the shell into vapor at a pressure somewhat above atmospheric. The condensate from the high pressure steam will leave the coils at a temperature slightly below that corresponding to 95 pounds or about 312 degrees F. Evaporators should be operated so that the condensate is not allowed to collect in the coils.

The heat of the liquid q_2 in the condensate is returned to the boiler through the feed tank and it should not be charged against the evaporator. The heat used by the evaporator per pound of steam is, where q_2 = heat in water returned to boiler and $q_1 + r_1$ = heat of water and latent heat of vaporization of steam entering evaporator.

$$q_1 + r_1 - q_2 = 294.5 + 890.9 - 282 = 903.4 \text{ B.t.u. per pound.}$$

The vapor from the first effect shell passes to the second effect coils where its latent heat is given up in evaporating more salt water. The distillate from the second effect coils at about 225 degrees F. drains to the main condenser or feed tank.

The vapor from the second effect shell passes to the evaporator feed heater where its latent heat is used in heating the feed water from 60 degrees or 100 degrees to 200 degrees F. The distillate from the heater should drain to the feed tank.

The raw water for evaporator feed is taken from the sea or from the discharge of the main circulating pump and after passing through the coils of the heater enters the shells of the first and second effect evaporators.

ILLUSTRATIVE PROBLEM

In order thoroughly to investigate the relative economy of evaporators, consider a ship with the following characteristics (see article by writer on page 71, February issue):

Length between perpendiculars = 420 feet.

Displacement = 14,600 tons.

Gross deadweight = 10,000 tons.

Speed = $11\frac{1}{2}$ knots.

Shaft horsepower = 2,980.

Geared turbine, watertube boilers, fuel oil.

Although the calculations used in this article are based on a 10,000-deadweight ton vessel operating on a 5,000-mile run, the figures given may be easily varied to suit any ship and any radius of action. In this case failure to use evaporators would cause an annual loss of \$39,360 in the case of a double effect system and \$35,600 in the case of a single effect system. This, of course, is based on the assumption of full cargoes, as the principal gain is due to increased freight carrying capacity. It would have to be modified in the case of measurement or partial cargoes but even then the increased boiler efficiency through the use of pure feed water is worthy of very careful investigation.

*Head of the course in Ship Construction and Marine Transportation, Lehigh University, Bethlehem, Pa.

Total steam per hour all purposes, excluding evaporators = 37,400 pounds.
 Boiler efficiency in service = 70 percent.
 Fuel per shaft horsepower per hour without evaporator = 1.00.
 Make-up feed (including water for drinking and culinary purposes) = 5 percent.
 Radius = 5,000 miles.
 Days on run = 19.
 Single voyages per year = 11.53.
 Pressure of live steam to first effect evaporator coils = 95 pounds absolute.
 Vapor pressure shell of first effect = 23 pounds absolute.
 Vapor pressure shell of second effect = 14.7 pounds absolute.
 Temperature of sea water = 60 degrees F.

DOUBLE EFFECT EVAPORATORS WITH HEATER

Allowing 5 percent make-up feed, the required output of the evaporator is,

$$37,400 \times 0.05 = 1,870 \text{ pounds per hour}$$

$$\frac{1,870 \times 24}{2,240} = 20 \text{ tons per day.}$$

With the calorific value of the fuel equal to 18,700 B.t.u. per pound, a boiler efficiency in service of 70 percent and 1.40 pounds of water evaporated by evaporators per pound of steam, we obtain,

$$\frac{18,700 \times 0.70}{903.4} \times 1.40 = 20.3 \text{ pounds of sea water, evaporated per pound of fuel.}$$

As already noted the heat of the liquid is not charged up against the evaporator as it is returned to the boiler via the feed tank. The above evaporation of 1.40 pounds of sea water per pound of steam is for a feed temperature of 100 degrees F. from the main circulating pump discharge. If an evaporator feed heater is used and the temperature of the raw water increased to 200 degrees F., the evaporation will be increased about 10 percent, giving $20.3 \times 1.10 = 22.3$ pounds of sea water evaporated per pound of fuel.

This evaporation, however, does not allow for the additional steam required for operating the evaporator feed pump. Allowing the salt feed water to be 50 percent in excess of that evaporated (which is the common practice to allow for blow downs), and allowing a lost head through the heater and piping of 35 feet, we have,

$$\text{Water horsepower of evaporator feed pump} = \frac{1,870 \times 1.50 \times 35}{33,000 \times 60} = 0.05.$$

Allowing 200 pounds of steam per water horsepower per hour for a small direct acting pump the steam used by evaporator feed pump is $200 \times 0.05 = 10$ pounds per hour.

$$\text{Steam per hour to first effect evaporator coils} = \frac{1,870}{1.40} = 1,340 \text{ pounds per hour.}$$

$$\text{Increase in steam consumption to allow for feed pump} = \frac{10 \times 100}{1,340} = 0.8 \text{ percent.}$$

Therefore the actual salt water evaporation per pound of fuel is,

$$\frac{22.3}{1.008} = 22.1 \text{ pounds of water.}$$

The total additional fuel oil required for working the evaporator plant is, $\frac{1,870}{22.1} = 85$ pounds per hour, or 17.3 tons per voyage.

For a voyage of 19 days the total make-up feed required would be $20 \times 19 = 380$ tons.

With fuel oil at \$1.55 a barrel and 338 pounds per barrel the cost of fuel for evaporating the make-up feed would be,

$$\frac{1.55}{338 \times 22.1} \times 2,240 = \$0.465 \text{ per ton of water.}$$

The increase in fuel per shaft horsepower per hour caused by using evaporator is

$$\frac{85}{2,980} = 0.03 \text{ pound per shaft horsepower per hour.}$$

This will make the total fuel per shaft horsepower per hour 1.03 instead of 1.00—an increase of 3 percent.

COMPARISON OF OPERATING EXPENSES WITH AND WITHOUT EVAPORATOR

(a) *Without evaporator*—(Make-up feed carried in double bottom).

Make-up feed water required per voyage = 380 tons.
 Net loss in carrying capacity per voyage = $380 - (10 + 18) = 352$ tons.

Weight of evaporator installation = 10 tons.

Weight of additional fuel for operating evaporators = 18 tons.

Cost of fresh water for make-up feed at \$0.30 per ton = $380 \times 11.53 \times 0.30 = \$1,320$ per year.

Loss in cargo revenue at \$10 a ton due to feed water carried = $352 \times 11.53 \times 10 = \$40,680$ per year.

Total annual loss caused by make-up feed = \$42,000.

(b) *With evaporator*.—(Double effect type with feed heater.)

Cost of evaporating per year at $46\frac{1}{2}$ cents per ton = $380 \times 11.53 \times 0.465 = \$2,040$

Interest, repairs and maintenance on evaporator plant (7 percent) = 350

Depreciation on evaporator (20 years) 5 percent = 250

Total annual operating charge = \$2,640

Annual gain due to use of double effect evaporator

$$\$42,000 - \$2,640 = \$39,360.$$

The cost of the 20-ton evaporating plant is made up as follows:

2 cast iron shell evaporators (with automatic feeders) ..	\$1,900
1 feed heater	1,500
1 distiller	700
1 evaporator feed pump	80
Miscellaneous piping and installation	820
	\$5,000

The double effect evaporator plant can be piped up so that it can be operated in parallel as two single effect 20-ton evaporators giving 40 tons per 24 hours, if required in an emergency.

The water for culinary and drinking purposes can be obtained from the coil drains of the second effect evaporator and no distiller or distiller circulating pump is necessary. A distiller, however, has been fitted for emergency use and piped up so that the distiller cooling water can be secured from the circulating pump of the main condenser. This eliminates the distiller circulating pump.

SINGLE EFFECT EVAPORATOR

(c) *With Single Effect Evaporator*.—If a single effect evaporator (with emergency distiller) is used without feed heater, the cost of the installation would be about \$2,500. One pound of steam at 80 pounds gage would evaporate only 0.78 pound of raw water. One pound of oil therefore will evaporate

$$\frac{18,700 \times 0.70}{903.4} \times 0.78 = 11.3 \text{ pounds of water.}$$

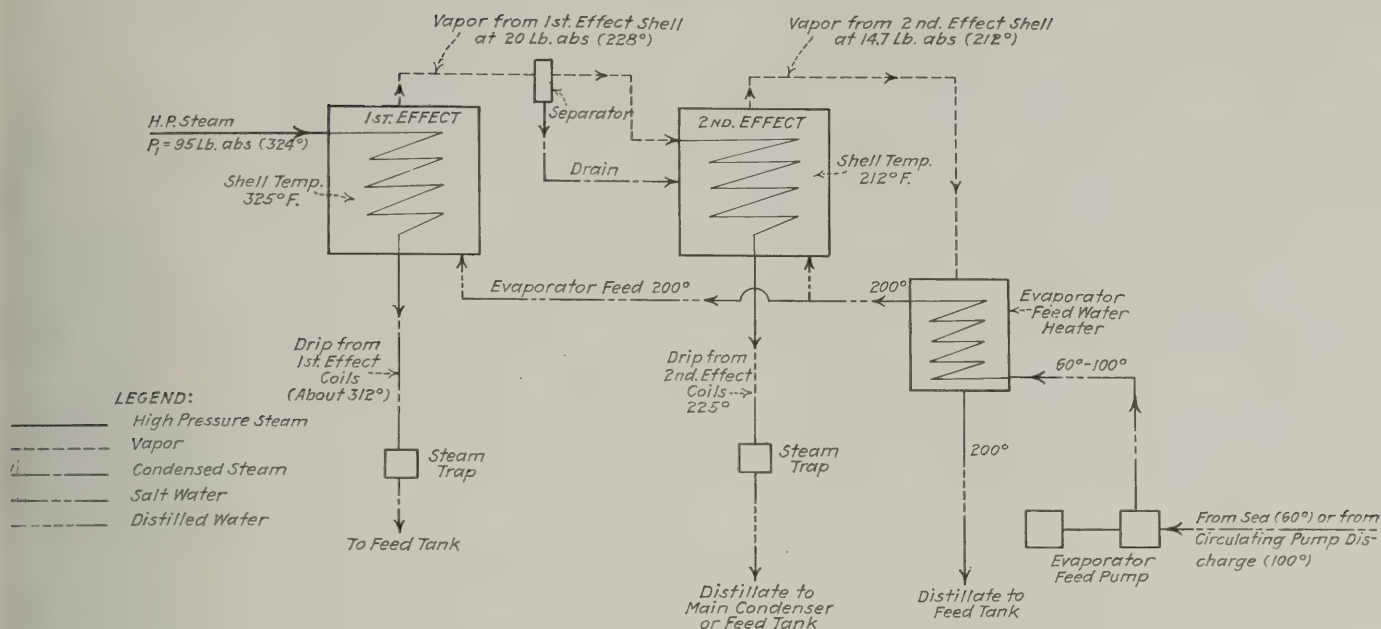


Fig. 1.—Diagram of Double Effect Evaporator Without Distiller

Correcting this for the consumption of the evaporator feed pump we have

$$11 \frac{11.3}{1.008} = 11.2 \text{ pounds of sea water per pound of fuel.}$$

The additional fuel required per voyage is

$$\frac{1,870}{11.2} \times \frac{24 \times 19}{2,240} = 34 \text{ tons.}$$

The increase in fuel per shaft horsepower per hour becomes 0.06 pound, instead of 0.03 for the double effect.

$$\text{Cost of evaporating make-up feed} = \frac{1.55}{338 \times 11.2} \times 2,240 = \$0.92$$

per ton.

Loss in carrying capacity by carrying feed-water = $380 - (35 + 10) = 335$ tons.

Without evaporator:

$$\text{Loss in revenue per year at \$10 per ton} = 335 \times 10 \times \frac{11.53}{100} = \$38,600$$

Cost of feed water per year at 30 cents per ton.....	=	1,320
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Annual loss by carrying feed water.....= \$39,920

With evaporator—(single effect):

Cost of evaporating make-up feed per year at 92 cents

per ton, $380 \times 11.53 \times 0.92$	=	\$4,020
Interest, depreciation and maintenance (12 percent)....	=	300

Total annual operating charge.....	≡	\$4,320
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Annual gain due to use of single effect, $\$39,920 - \$4,320 = \$35,600$.

The single effect evaporator, therefore, shows an annual gain of \$35,600 as compared with \$39,360 for the double effect evaporator.

The above calculations show that there is a gain of \$3,760 a year in favor of the double effect evaporator as compared with the single effect evaporator.

CONCLUSIONS

The foregoing calculations show that when full cargoes can be secured there is a marked gain in annual income by using double effect evaporators in contrast to carrying make-up feed. Fresh water has been taken at 30 cents a ton which is the average cost in American ports. If water runs as high as 50 cents a ton, as it frequently does, the cost of water and evaporation are about equal.

When evaporators are used there are several additional gains and advantages chief of which are the following:

- (1) Pure feed water and the elimination of boiler scale which results in a higher boiler efficiency and reduced repair and cleaning charges.
- (2) Increase in the rate of evaporation in the boiler can be allowed due to the pure feed water.
- (3) Elimination of boiler blow losses.
- (4) Increase in temperature of water in feed tank due to high temperature of evaporator drips. In the above double effect installation the make-up feed enters the feed tank at about 200 degrees instead of 60 degrees. This increases the temperature of the feed and filter tank.

$$\frac{1,870 (200 - 60)}{38,750} = 6.7 \text{ degrees.}$$

With 250 pounds pressure and 100 degrees superheat at the boiler, the British thermal units per hour required are,

$$38,750 \times 1,264 = 49,000,000 \text{ B.t.u. per hour.}$$

The British thermal units increase at the feed tank is

$$1,870 \times (200 - 60) = 260,000 \text{ B.t.u. per hour.}$$

This results in a gain in plant efficiency of 0.5 percent.

OPERATION PRACTICE ON MERCHANT SHIPS

In order that evaporators function properly it is necessary that the salinity of the water in the shell should not exceed 3/32. This requires regular blow-downs either continuously or intermittently of about one-half of the amount evaporated. The general practice is to blow continuously and to fit regulator valves that maintain a constant level in the shell. This results in a constant salinity of about $2\frac{1}{2}/32$.

If self-scaling evaporators are used, such as the Reilly type with submerged coils, the coils can be kept free of scale by emptying the evaporator, according to their instructions, once each watch. When evaporators are operated on the above plan, double effect evaporators are as easy to take care of as the single effect type and the economy is practically double.

The condensate and distillate and drips from the coils should always be sent to the feed tank where the heat of the liquid can be saved. They should *never* be allowed to go to the main or auxiliary condenser.

Chamber of Shipping Discusses Maritime Situation

Recent Contracts for New Vessels in British Yards Unprofitable—Shipowners Faced With Additional Burdens—Shipping Depression Continues

By W. H. Wendon

THE past few weeks have produced topics of unusual interest to shipowners in the United Kingdom and abroad, for in the period under review the annual meeting of the Chamber of Shipping of the United Kingdom, the leading maritime body in the country, has been held. The subjects discussed have, as usual, been of importance befitting the occasion. Let us take, first of all, the situation which has arisen with regard to the recent placing of contracts for new vessels.

In the late autumn, it will be recalled, many shipowners took their courage in their hands and contracted for ships, presumably in the belief that the slump was ending, if, indeed, it had not already been passed. But it has since transpired that these contracts were placed at figures which—certainly from the point of view of shipbuilders, if not from that of shipowners themselves—precluded the contracts resulting in a profit. The position may be summarized as follows: There are shipowners who would not be averse to contracting for new boats in the neighborhood of £8 to £8 10s. per ton on the deadweight, but they definitely refuse to go higher than these quotations. Many contracts recently placed, it may be mentioned, were at figures between £8 10s. and £9 5s. If, then, shipbuilders are going to lose on the orders already placed, it is patent that, if contracts were accepted at owners' present views, the losses of builders would be still further increased, for in the meantime their costs of production have not materially diminished. This, then, must be held to account for the slackening off which has been apparent in the placing of new orders, coupled, of course, with the hitherto non-materialization of the "boom" in shipping.

SHIPPING DEPRESSION NOT YET ENDED

This method of reasoning is substantially on the lines of the arguments put forward by Sir Ernest Glover, the newly-elected president of the Chamber of Shipping, for at the gathering to which I have already referred he told his listeners that the first reflection which must occur to all is that the period of depression from which the shipping industry has been suffering for so long is not yet at an end. Twelve months ago the then president of the Chamber expressed the opinion that things were so bad that they could not very well get any worse, but the past year, in Sir Ernest Glover's view, has proved that, however deep the abyss may be into which shipping has fallen, there is always the possibility of the bottom of the abyss dropping out. Lest he should be thought to be exaggerating in making this statement, he gave the reminder that in several of the main trade routes of the world, rates of freight in 1922 were less than half the average rate of 1921, which was a bad year. On the other hand, there have been some reductions in running costs, but nothing which can compensate for such a fall in freights as has occurred. Taking the market value of ships today, and comparing it with the value even a year ago, Sir Ernest Glover fears that it must be recognized that there has been a very material shrinkage.

The new president's outlook for the future is not particularly rosy. He recalls that during last autumn shipowners saw a ray of light on the horizon, owing to an improvement in some markets, especially in the East, which had persistently maintained an attitude of extreme depression. This

improvement, and a reduction of shipbuilding costs, induced a good many owners to take heart and order new steamers. Builders were anxious to get work to enable them to keep their yards going and their staffs together, and no doubt they did accept work on very moderate terms, in view of the present level of costs of production—in fact, terms offering little or no prospect of profit. The hope of the late autumn gradually waned as the winter progressed, and Sir Ernest Glover ventures to consider that the outlook today is not nearly so promising as it was three or four months ago. Nevertheless, although his remarks may be regarded as pessimistic, he claims to be no pessimist. No shipowner, he holds, can be a pessimist. If he is, he must cease to be a shipowner. He believes in a sane optimism which does not under-rate the difficulties, but decides to meet them with courage and with a determination to win through, "and so reach the smoother waters which shipowners hope and believe lie ahead."

SHIPBUILDER DEPLORES BUILDING VESSELS AT A LOSS

Turning from the shipping position as seen through the eyes of a shipowner, it is not without interest to study the situation as it reveals itself to a front-rank builder of ships. Sir Alexander Kennedy, the authority to whom I am referring, is the chairman of the Northumberland Shipbuilding Company, Ltd., an important North of England concern, and his views at all times receive respectful consideration, both from his fellow shipbuilders and from shipowners. Apropos the present position, he does not mince matters. Frankly, he deplores what he describes as the tendency on the part of shipowners of expecting ships to be built at a loss, and he emphasizes the necessity for shipbuilders receiving reasonable remuneration for their work, pointing out the hampering effects of high costs of raw materials. He feels that at the present time the shipbuilding industry is at the cross-roads, and makes reference to "the slight flow of orders" in recent months—enough to give employers and workmen a chance to prove themselves. He maintains, however, that there is a definite limit to the extent to which shipbuilders can incur the risk—he might almost say the certainty—of loss.

Ships taken recently have been at prices which certainly cannot be repeated without a change of circumstances; shipbuilders, he says, have no desire to raise prices, but they cannot reduce them further in the present circumstances, or, he fears, for a long time to come. He feels that there is a tendency on the part of shipowners to place too heavy a burden upon shipbuilders and their workmen, and that there are some who expect builders to construct ships at a loss in order that they (the shipowners) may run the vessels at a profit. In conclusion, Sir Alexander Kennedy considers that, while the total price of ships has no chance of being further reduced for a long time to come, there must be an internal adjustment, "to give the builders a chance of receiving reasonable remuneration." It is not sound business, he says, to fill yards at present prices, nothing would be more disastrous than an appreciable rise in the price of new ships, and he trusts that, in spite of what has occurred on the Continent, coal owners and steel makers realize that an increase in the price of raw materials for the industry is bound to have a

hampering effect and completely stop any chance of trade recovery.

ADDITIONAL BURDEN FOR SHIPOWNERS PROPOSED

The shipowners of the United Kingdom are face to face with a new trouble revolving round what is regarded as an "economy stunt." The Board of Trade has framed certain definite proposals with a view to their being incorporated in a new Parliamentary Bill. It is proposed, *inter alia*, to raise the fees for tonnage measurement and for the yearly survey of passenger ships, and also to prescribe fees for signing on and signing off crews. The general effect of the proposals, it is felt, will be to shift the burden on to the shoulders of the shipowner from the Government Department concerned.

The Board of Trade recommendations arise from the "Economy Report" issued twelve months ago by the Geddes committee, dealing, among other things, with the mercantile marine services. One of the committee's recommendations was that the department should be rendered self-supporting by reducing the cost and charging shipowners additional fees in connection with the engagement and discharge of seamen. The report stated:

"The Mercantile Marine Offices were originally started in 1850 with the idea that they should be self-supporting by fees levied for engagement and discharge of seamen, but these fees, which amounted to, roughly, £70,000 in 1882, were abolished by the Board of Trade in that year. In 1892 Parliament took away from the Board of Trade their power to charge any fees in connection with engagement and discharge at a mercantile marine office. There is now no power, therefore, under the Merchant Shipping Acts to levy fees for the engagement and discharge of seamen in the United Kingdom, but fees are paid by the shipowner, if the engagement and discharge takes place on board ship at the request of the shipowner."

The total number of engagements and discharges of seamen per annum is approximately one million, and the committee recommended that the service should be rendered again self-supporting as it was prior to 1882 after certain steps had been taken for reducing the cost of the organization.

So much for this measure in broad outline. Shipowners resent the scheme whole-heartedly. Indeed, they feel serious apprehensions at the suggestion that, in addition to existing burdens, the shipping industry is to be saddled with the cost of carrying on an expensive government department, over the operations of which it has no control whatever. Shipowners point out that they pay very substantial fees for surveys, tonnage measurement, and so on, as a contribution towards the expense of this department, and they make no complaint of that. But they feel that they are entitled seriously to challenge the suggestion that these fees for surveys, etc., should, roughly speaking, be quadrupled, and that, in addition, the mercantile marine offices at the ports should be maintained by charging the shipowners 2s. 6d. for every man signed on or paid off.

It is estimated that the effect of the Government's proposals will be at once to throw an additional charge of about £400,000 per annum upon the shipping industry. Shipowners believe the principle upon which the Government is proceeding to be entirely wrong, and express the hope that it will think again before it places what they (the shipowners) deem to be so dangerous a precedent upon the Statute Book.

FOREIGN TAXATION OF SHIPS

Another matter which is receiving the close attention of shipowners is in regard to the taxation of ships in the countries to which they may happen to be trading. And this is a subject with which the United States is very intimately associated. It is conceded here that it is an unchallengeable fact that Great Britain in 1916 took the step of making foreign ships using her ports pay income tax. The immediate result was retaliation, and, from the British point of view, so serious has the matter become that two liner companies alone,

in the course of one year, paid no less a sum than £160,000 sterling in income tax to the United States Government.

In November, 1921, the International Shipping Conference, attended by delegates from every country possessing a merchant marine worthy of consideration, carried a resolution expressing, *inter alia*, "the desirability, in the interests of international trade, that legislation be encouraged in every maritime country in the world giving immunity from taxation in respect of the earnings of foreign shipping in all cases where such immunity is reciprocally given." In the same month the United States Defense Act became law, and contained a clause which gave effect to the principle for which the Chamber of Shipping and the International Shipping Conference had contended. The clause provided that no income tax should be payable in the United States of America upon profits of ships belonging to countries which gave similar exemption to the United States.

It is felt in United Kingdom shipping circles that this question of taxation abroad has reached such a level that steps should be taken to induce the British Government to accept what is generally regarded as America's fair offer. It is urged, moreover, that the Government would be well advised to accept the offer *now*.

One aspect of the matter which, in present conditions, is regarded as the most serious is that shipowners are taxed on profits beyond the measure of real profits, and even when real profits do not exist. It is emphasized that, unless this "pernicious" taxation system is nipped in the bud, a race may be seen between different countries as to who can extract the most from the shipowners. And the retaliation which may result from such a race may be easily pictured. The view of Sir Ernest Glover is that anything of the kind is much to be deprecated, and can only tend to hamper trade, while the increased costs being thrown on the shipowner must eventually be reflected in the rate of freight charged, to the prejudice of the country imposing such taxation.

WAGE REDUCTION OF BRITISH SEAMEN TO BE CONSIDERED

Every effort continues to be made to bring about reductions in steamship operating and working costs. There has, it is true, been an amelioration in dock and similar charges during the past year, but it is felt in shipowning circles that these reductions will not bear fruit in a revival of trade prosperity unless they are followed up by further substantial reductions in all charges incident to overseas transport. The item regarding which the greatest anxiety is experienced is in regard to wages. In the first place, British seamen's wages are still about 100 percent more than was paid before the war. It is, therefore, scarcely surprising that when, for example, dock workers are approached with a view to lowering their wages, they reply in effect: "Put your own house in order first"—in other words, bring down the wages of seamen.

This matter of reducing seamen's wages in Great Britain is to receive the serious consideration of those concerned, but it is appreciated that the position is an extremely delicate one. In this connection some remarkable statistics have been prepared by the Chamber of Shipping comparing the wages paid in this country and in Germany. Thus, the monthly wages and salaries of German officers and crew are as follows, the equivalent value in English money being given: First officer, £2 9s. a month, as compared with £18 10s. to £25 in this country; first engineer, £3 1s. 10d., as compared with £21 to £24 in this country; able seamen, £1 9s. 3d., against £10. Almost without exception, wages in Great Britain are the highest today in any maritime country in the world.

CONTINUOUS EMPLOYMENT OF SEAMEN DESIRABLE

An improvement in the method of employing seamen is one of the interesting subjects which have arisen during the past month. Sir Ernest Glover is responsible for bringing the matter to public notice. The system by which men are

signed on for the voyage is, he holds, eminently unsatisfactory, as employers never get to know anything of the men, and similarly the men know nothing of their employers. There is thus little or no chance of employers and employees taking a mutual interest in each other. But without an alteration in the law it would be impossible to make employment continuous, for not only is the sailor entitled to be paid off at the end of the voyage, but the owner is entitled to pay him off, and thus the practice has been established. Sir Ernest Glover, therefore, suggests the possibility of devising a scheme whereby employment might be practically continuous.

The difficulties which would certainly arise are not lost

sight of: For example, steamers, for some reason or other, might be laid idle for a considerable period, during which the crews would of necessity have to be paid off. It would, therefore, be necessary to have a clear understanding that men signing on would be available for working ships in port, and the scheme would have to be adopted by all shipowners, if success was to be achieved. The advantage to shipowners would, it is thought, accrue by saving riggers and shore gangs while in port, and, if reductions are to be made in wages, it is felt that the negotiations would be easier, if the reduction were coupled with some arrangement whereby the practical continuity of work could be relied upon.

Society of Naval Engineers Holds Annual Banquet

**Secretary Denby Outlines Salient Features of Naval Policy and
Secretary Hoover Urges Standardization of Business Methods**

THE annual banquet of the American Society of Naval Engineers was held at the New Willard Hotel, Washington, D. C., on February 27. Among the prominent speakers were Edwin Denby, Secretary of the Navy; Herbert Hoover, Secretary of Commerce, and Admiral R. E. Coontz.

In speaking of the work accomplished by the Navy during the past two years, Secretary Denby pointed out that it was the policy of the Administration to maintain our Navy at sufficient strength to protect our overseas possessions. The Navy, he said, exists to guard commerce and to provide national security. In addition to this, he declared it does a large amount of humanitarian work of which Smyrna is an example. The time of haphazard establishments and shore policies has passed, the Secretary said, and in its place great fleet bases have been built up.

Secretary Denby pointed out that the policy of keeping oil

underground for the future use of the Navy has resulted in many cases in the oil being drained off rapidly from neighboring fields. The Administration, therefore, had transferred the responsibility for an adequate naval oil supply to the Department of the Interior. Tank space has been reserved where oil may be placed in storage in order to insure conditions that would adequately serve the Navy in times of emergency.

FLEET MOBILIZATION

The grand United States Fleet has been created, the Secretary declared, along lines similar to that practiced by other nations and almost all vessels of any consequence have been included in this fleet.

We are trying, Secretary Denby said, to get a bill through Congress that will put our Naval Reserve on a fixed basis.



Annual Banquet of the Society of Naval Engineers at the New Willard Hotel, Washington, D. C., February 27

He was sorry to have to say that we had only a skeleton reserve at the present time. In regard to the enlisted personnel he thought there could be an amelioration of punishments in many cases. This subject he said has been given much study as problems concerning the enlisted men were very close to his heart.

RE-ESTABLISHMENT OF CREDIT AND TRANSPORTATION

Secretary Hoover spoke of the work that naval officers had done in assisting in the re-establishment of credit and transportation after the war. He said that they had called upon the Navy to detail some 30 or 40 officers and had then given these officers instructions that they wanted the seaports opened. Thousands of tons of material had been sent into foreign ports under the direction of these officers and in his estimation never had arrangements been made with more businesslike precision.

SIMPLIFICATION OF BUSINESS METHODS

There is a realization, declared Secretary Hoover, that there must be simplification in our business methods. We

have relied upon mass production but we need to make further progress in the replacement of parts which means a greater simplification.

The Navy gives a moral background, the Secretary asserted, that will provide the encouragement to undertake marine and commercial ventures. It gives a feeling of security to American commerce and is a cheap form of insurance.

60,000 MEN AT SEA

Out of the 86,000 men that Congress has allotted to the Navy, said Admiral R. E. Coontz, 60,000 are at sea. One of the greatest things in the world is morale and it was feared that the reduction in naval personnel would injure it but he was glad to say that it did not.

Speaking of the mobilization into one fleet, Admiral Coontz pointed out that the Commander-in-Chief was in this way relieved from many petty details and could exercise his brains on strategy. The Pacific ocean, he said, would be the most important in the future and plans had been made for a great base on that coast and other minor bases all the way down from Alaska to Hawaii.

A Survey of Philippine Shipping Conditions

American and British Ships Share Trade About Equally—Japanese Vessels Dropping Behind—Extension of Coastwise Law Discussed

By Vicente Villamin

LIKE Coue's formula for a happy life shipping conditions in the Philippines are getting better and better. More and better equipped steamers, both passenger and freighters, are now giving improved and speedy service. Healthy competition and the reviving foreign trade are the two determining factors in the situation.

The trade for 1922 amounted to over 359,000,000 pesos, registering a balance of approximately 25,000,000 in favor of the Philippines. The bulk of the trade was done with the United States, it being valued at 224,000,000 pesos, of which 28,000,000 was exports and 96,000,000 imports.

British ships led in the volume of the trade carried, the American coming a close second. Cargoes valued at 135,000,000 pesos were moved in British bottoms as compared with 132,200,000 pesos in American. In 1921 the proportion stood at 169,700,000 pesos British and 139,000,000 pesos American. Of a total of 1,272,779.77 tons engaged in ocean shipping, 448,971.42 was British and 405,273.01 American. It will be seen therefore that American vessels carried the largest volume of the trade on the basis of relative size of tonnage. In 1920 the American tonnage was 79,164.41, British, 399,094.56 and Japanese, 328,092.74. Of course, American vessels from 1918 to 1920 transported the bulk of the trade. Japanese vessels on the run are being pushed more and more behind.

HOW TRADE IS DIVIDED

Specifically taking up the trade between America and the Philippines, official figures show that during the first 11 months of 1922, 75 percent of the imports from the Pacific coast and 15 percent from the Atlantic Coast were carried in American vessels. Regarding exports, 67 percent to the Pacific Coast and 45 percent to the Atlantic Coast were carried in American ships. With the allocation by the Shipping Board of more tonnage to the Atlantic-Philippine trade American bottoms will undoubtedly take away proportionate cargo from the foreign lines.

During the period under review 956 first and 6,600 third

class passengers sailed from Manila to the Pacific Coast, including Honolulu and Vancouver. During the same period in 1921 there were 959 first and 4,571 third class. During 1921, 57 percent of all passengers traveled in foreign vessels and 43 percent in American vessels. In 1922 the position was reversed, being 54 percent for American and 46 percent for foreign vessels. Members of the Army and Navy are excluded. Their travel is taken care of by the army transport service. The showing of American passenger steamers cannot be but highly encouraging, especially in view of the fact that the most commodious and the fleetest liners on the run are the Empress greyhounds of the Pacific operated by the Canadian Pacific Steamship Company.

AMERICAN MAIL SERVICE PREDOMINATES

In connection with mail service, the United States Government paid during the fiscal year \$744,741 to American vessels and \$163,633 to foreign. The American payees were the Admiral line, Oceanic (Spreckles), Pacific Mail Steamship Company, the China Mail Steamship Company and others whose contracts amounted only to \$4,200; and the foreign were the Union Steamship Company, Toyo Kisen Kaisha, Osaka Shosen Kaisha, Nippon Yusen Kaisha, Canadian Pacific and others which received a total of \$17,545. It should not be overlooked that the payments were made for mail service between America and the entire Far East.

Besides Cebu and Iloilo new ports have been made ports of call for ocean-going steamers thus obviating expensive trans-shipment in Manila. In this service Shipping Board steamers lead. This is a matter of general congratulation.

During the past year steamers under the German flag took their places in the trade after an absence of eight years. A new line, the Hugo Stinnes Far Eastern Services, has been added. The Canadian Pacific placed two additional steamers on the Vancouver-Hongkong run, connecting with Manila by auxiliary service. Of the American, the Tampa Inter-Ocean Service Steamship Company, operating a monthly service, made its appearance. The Pacific Mail discontinued

its Manila-East India Line as well as the direct line between San Francisco and Manila via Honolulu as it was found unprofitable. It must be pointed out, in this connection, that 1922 was a poor foreign trade year.

THE PAN-PACIFIC COMMERCIAL CONGRESS

It is interesting at this juncture to recall that in November last an international gathering of prominent men from countries bordering the Pacific Ocean met in what is called the Pan-Pacific Commercial Congress in that sunny and romantic city of Honolulu. Of the various propositions brought forward to promote the best interests of the region the most ponderous, and incidentally the most indicative of the unsettled shipping conditions on the Pacific, was that offered by an American. This shipping connoisseur proposed to divide the wide ocean into zones, these zones to be allocated to the different maritime nations in order to control the size of tonnage in relation to the requirements of the trade in the respective zones and thus effect the elimination of unnecessary bottoms which increase operating and maintenance expenses and become a burden on commerce and trade. It appears to the writer that this fantastic proposition has served only to make the delegates overlook the fact that the biggest shipping question that can engage the minds of those interested in the Pacific trade is the proposed extension of the United States Coastwise Laws to the Philippines.

The Honolulu conclave which aimed at a rapprochement in amity, commerce and intellectual interest between the countries participating entirely missed the coastwise law question which is causing much dissatisfaction and speculation. The idea of internationalizing the trade and shipping situation in the Pacific, proceeding from the theory that trade is nationless and tribeless and thrives best where transportation is free and unshackled, will be blasted beyond identification. The Filipinos know of the anomalous fact that one can make shipments from San Francisco to Manila, for instance, more cheaply than he can from San Francisco to Honolulu despite the further distance of 4,000 miles to Manila. They know, of course, that by the operation of the coastwise law in Hawaii competition is eliminated, and its meaning is easily realizable.

DISTANCE A VITAL ELEMENT

The distance of the Philippines from the mainland of America is a vital element in the discussion of the wisdom or unwisdom of applying the law to that country. The Philippines is almost equidistant between America and Europe. Vessels originating from the Atlantic seaboard, with which the bulk of the trade is done, have longer voyages to make than those coming from European ports. The difference in ocean distance between the Panama Canal route and the Suez is only around 100 miles to the port of New York. When the freight is increased the tariff advantage which America and the Philippines enjoy from each other will be wiped off and the exports of America to that country will be subject to unnecessary ruinous competition from European and Oriental exports. This, of course, means the diversion of trade from America to Europe, a consummation stoutly to be prevented.

The only remedial measure is to raise the tariff wall around the Philippines (that country has a different tariff law than the United States). This might be desirable were it not that the result would be the raising of the cost of living in that country. This is one of the strongest reasons why the Filipino people are dead against the extension of the coastwise law to their country.

Manufacturers in the United States are opposed to the plan because the increased cost of transporting merchandise will either have to be absorbed by them or passed on to the ultimate consumers in the Philippines. Being unprepared to do the former they see that by making the consumers pay

will only result in the diminution of the demand and therefore a distinct loss to them.

Another thing that should interest American manufacturers who sell to the Philippines is that high freight rates will operate against Philippine exports and consequently impair the purchasing capacity of the country; while to those manufacturers who buy raw materials from the Philippines, advancing transportation and handling expense will place them at a big disadvantage in competition with manufacturers of similar products in foreign countries. To instance this assertion, high freight rates on copra, a tropical staple on the free list, will inevitably send it from the primary markets in the Far East to either Marseilles or Hull for crushing, and, also, the American coconut oil mills will be rendered idle. And shipments of oil from Europe to America will be resumed as in pre-war times. American oil crushers naturally are found to be in opposition to the law.

EFFECT ON MANILA

With regard to the effect of the law on the hope of making Manila a leading entrepôt in the Orient, opinions widely vary. The writer believes it will blast that hope completely. An American steamer leaving San Francisco, for instance, calls at Manila and then sails on to Batavia, Java. The same itinerary is followed on the return voyage. She can carry cargo between the three mentioned ports without contravening any law. On the other hand, a Dutch liner from San Francisco cannot carry cargo or passengers from that port to Manila and it would not be worth its while to make a detour to the latter port to pick up whatever business it could get for Batavia. The resultant condition would be virtually to confine the bulk of shipping between Manila and Far Eastern ports to American bottoms. There should really be no objection to that scheme were it not so inimical to trade in placing the Philippines on a non-competitive basis. The geographical position of the country in relation to America and the highly competitive nature of its products will affect very adversely its economic existence if it were to be placed out of joint in the scheme of commerce in the Far East by restrained transportation facilities.

From this point the discussion can go to the claim that by the American ships giving the "stoppage in transit" and "fabrication in transit" privileges to shipments out of Manila to surrounding ports the talk of making Manila the distributing point for American manufactured goods will be nearer to realization. The writer sharply differs from this view. Upon the precedent of comparative freight rate to Hawaii, it is not improbable that the rate from America to Manila would be higher than to, say, Batavia, Sourebaja, Saigon or Singapore, the difference in distance not being over 2,000 miles and the long haul making the steaming distance comparatively shorter. Besides, it is reasonable to expect that shipments from America to foreign ports in the Orient will be made in foreign flag steamers who can quote lower rates.

Certain maritime laws are simply constricting the life of the American merchant marine, which deserves to exist and exist in a fashion that is befitting the world importance of America. The coastwise law proposition as regards its extension to the Philippines which is separated from the mainland of America by the widest ocean in the world will tend to destroy the Philippine-American commerce and ultimately redound to the damage of the merchant marine itself.

FOR CONVERSION TO MOTORSHIPS.—Sidney Henry, Director of Sales, United States Shipping Board Emergency Fleet Corporation, announces that the steel tankers *Bidwell* and *Miller County* of 10,254 deadweight tons each, and the steel cargo *Challenger* of 11,850 deadweight tons, have been sold to the Sun Shipbuilding Company, Chester, Pa., for conversion to motorships.

Recent Developments in Marine Insurance

**Discouraging Outlook — Over-Insurance — “Sister Ship”
Salvage—War Rates—Towing—Barge Canal—“Collision”**

By “Bordereaux”

MARINE underwriters are considerably discouraged by the failure of the passage of the Ship Subsidy Bill, particularly as it comes at a time when many other factors are conspiring to restrict a prospect of profit in their business. They fear that the collapse of the subsidy campaign presages a lack of interest in our maritime affairs and may mark a declension of our merchant marine to a point of unimportance comparable to that of pre-war days. If it is true that insurance follows the flag, then the loss of our merchant marine holds out little hope for American underwriters, particularly as they are in daily active competition with a nation whose maritime affairs are its chief consideration and where the Government and the various branches of industry stand firmly behind all measures for the advancement of overseas trade.

With the conclusion of the first quarter of 1923 opportunity presents itself to permit of underwriters making a reasonably accurate survey of the outlook for the year. It is the judgment of the Street that 1923 will not result as satisfactorily as did its predecessor, comparing the actual underwriting outcome of each year. The principal reason for this anticipation is the forced lowering of rates to a point, in many instances, far below those of the pre-war period. One class of commodities after another has been subjected to average rate attacks, under spur of hungry competition, until it is impossible to name a single important class of merchandise or hulls which has escaped the raiding tactics. Premium at any price appears to be the slogan, even in what have always been regarded as conservative offices. It is a problem how long the situation can endure.

Still another influence that has a conflicting effect on the marine insurance business for 1923 is the increasing prosperity of the country. Strange as it may seem, marine insurance is both benefited and injured by a wave of prosperity at home. It is benefited in that when wages are high everyone has money to spend and there is a demand for commodities which greatly increase our import trade, thus augmenting premium writings on important business from abroad. And the insured values are higher, with a corresponding increase in premium volume, because prosperity generally means an advance in prices. But, unfortunately, there is often a reflex action in a rising tide of prosperity, that an increase in wages and commodity prices at home makes it more difficult for the American exporter to compete in foreign markets for the world's trade. Just now, in many cases, our exporters are finding increased difficulty in selling their products. This is notably true in the textile and other manufactured goods trade. If the English and German export markets were on a normal basis our export trade would feel this competition even more keenly than it does today. The only consolation that remains to the American underwriter is “the unexpected”; possibly relief may lie that way.

Over-Insurance

FROM time to time ill-formed parties break into print with protests against over-insurance of steamers by means of “honor” policies. This they pronounce a grant abuse of the system of P. P. I. coverage. These antics appear to be unaware of the fact that the underwriters have themselves adopted measures for the prevention of ex-

cessive sums being insured in respect of vessels by stipulating that the amount covered on disbursements shall not exceed 15 percent of the value of the steamer. Owners acting to the contrary are wasting both time and money, for if excessive insurance is taken out they would be unable to recover in event of loss.

“Sister Ship” Salvage

IN the past, difficulties have frequently arisen over the allowances which the Shipping Board has made to its own ships for salvage services rendered them. It is believed that trouble along this line will be obviated in the future through the good offices of a special committee that has just been appointed to act in an advisory capacity in this connection. The committee consists of George B. Ogden, chairman; Douglas F. Cox, William D. Winter, Hawley Chester and J. S. Gilbertson. Settlements arrived at by them will doubtless meet with general approval among underwriters insuring cargo in the vessels involved.

The regular Underwriters' committee recently attended a conference arranged with W. J. Love, of the Shipping Board, for the purpose of reviewing with the officials of that organization the arrangements for the handling of P. and I. claims. It found the Board most anxious to meet its proper cargo liabilities in a spirit of fairness and liberality. Mr. Love assured the committee that the Board stood ready to recognize all of its just liabilities and is prepared to provide machinery which will insure the prompt settlement of proper claims against it. The Board also expressed its readiness to confer with the committee representing the underwriters at all times for the purpose of adjusting any outstanding difficulties and smoothing the way for reciprocally satisfactory relations. When the subject of allowances came up Mr. Love showed a disposition to take a broad view of the matter and invited the formation of a committee to discuss with representatives of the Board the amounts to be allowed for “sister ship” salvage services, preliminary to the making of such awards. To this end the above-named committee was formed.

Barge Canal Hazards

AUTHORITATIVE estimates of the underwriting losses incurred on hulls and cargoes on the New York State Barge Canal last year fix the approximation in excess of \$700,000. The premiums scarcely passed \$200,000. In the light of such a disastrous experience the natural inclination of the underwriters is to abandon barge canal coverage altogether; and this they have determined to do unless the State will introduce substantial improvements for the safeguarding of floating property on that important waterway. And what the underwriters quote in the way of rates is something of prime importance, since it represents an overhead charge that will determine shippers to abandon the canal in favor of rail transportation. A co-operative movement is now under way, in which underwriters and transportation men have joined issues, and they have submitted, through a joint committee, a series of recommendations which Superintendent of Public Works Walsh proposes to make use of in an attempt to secure from the New York Legislature funds for

effecting the improvements indicated. The insurance men on this joint committee are Howard W. Beebe, chairman; Edgar E. Lethbridge and George C. Owens; and the transportation men are G. Roy Hall, of the Inter-Waterways Line; S. MacClinkan, of the Trans-Marine Corporation; and S. W. Bullock, of the Inland Marine Corporation.

Among the more pressing improvements recommended by this committee are the building of a new breakwater off the Eastern entrance of Oneida Lake to protect shipping against the northwest winds, the buoys of the North and Middle channels of the lake, and the installation of a system of storm signals at each end of the lake. It is a singular fact that whereas the rapid rises in the Mohawk River caused most of the losses in 1921, in 1922 the scene of disasters shifted almost entirely to Oneida Lake.

War Rates Reduced

WITH France making steadily increasing incursions into German territory the question of a possible war between those nations is frequently under consideration by underwriters, but the matter is not as yet in a position to cause serious anxiety. It is difficult to arrange an equitable basis for determining war rates because, as a matter of fact, there is no war, and any violation of the Versailles Treaty on the part of France is a different thing from an act of war. England, being nearer than we are to the seat of these troubles, is in position to act with the greater intentness and accuracy; and the Britishers are evidently complaisant as respects war possibilities. To this end their underwriters have recently made a substantial reduction in war rates, as follows: German steamers outward bound from German ports, 5 shillings; homeward bound, 7 shillings and 6 pence. Steamers of other nationalities, outward and homeward, 6 pence. These rates will have their effect in the American market, with the added consideration of how the delicate balance of scowling nations at peace may be adjusted to warlike activities.

Responsibility in Towing

BY a recent court decision a ship that undertakes a tow is held responsible if she abandons her tow in order to save herself and the towed vessel is later lost because of the exhausted condition of her officers and crew occasioned by their efforts while in tow. Under such conditions, also, the negligence of the towing vessel cannot be charged to her charterers, where the charter was not a demise, 284 Fed. Rep., 56. In this instance in court the Norwegian bark *Aggi* was undertaken to be towed by the steamship *Edgar H. Vance*, then under charter to W. R. Grace & Company, from San Francisco to Balboa, Isthmus of Panama. Action was brought by the underwriters on the lost *Aggi*. In view of the terrific storm that was raging when the tow began, and in the light of the evidence as to disregard of weather probabilities on the part of the master of the towing vessel, the latter was adjudged guilty of maritime negligence and his vessel was held responsible for the damage caused by the *Aggi's* stranding after she was abandoned by the *Vance*.

New P. & I. Agency

ON February 20 the new United States Protective and Indemnity Association went into active operation, with more than 100 agents on duty at the more important ports throughout the world. These agents have authority to settle claims up to a maximum of \$1,000; larger claims will be taken up by the home office. This is an offshoot of the United States Shipping Board, but it will do business with private owners as well. Its president is Nathan A. Smyth; vice president, in charge of domestic work, Capt.

I. L. Evans, director of the Sea Service Bureau and an expert in admiralty law; Capt. F. E. Ferris, formerly Shipping Board Commissioner at London, in charge of foreign activities; John Nichol, formerly of the Old Dominion Line head of the cargo department; Oliver C. Garvin, of the claims department of the Barber Line, in charge of personal injury; and F. D. Yott, former legal adviser to the American Red Cross in Europe, legal adviser for the foreign department.

The organization will handle business of a liability nature that is not usually covered under the straight marine policy the Protection and Indemnity Clauses being introduced, where desired, to effect this protection. In cases where owners desire to have all their liability covered under a single policy, it is advantageous to have this feature taken care of in the special clause.

It was formerly the custom for underwriters to assume under the Collision Clause only three-quarters of the collision liability and to assume none whatever for loss of life or personal injury or for damage to harbors, docks, piers, nor for damage to goods on board the vessel, nor for any other liability for which the owner might be held by law. The theory behind this action was that leaving one-quarter of the collision liability with the owner would have the effect of making him more diligent in seeing that his vessel was carefully navigated. Thereupon there arose clubs that undertook the insurance of these factors, and the result was that all the supposed advantages of leaving these risks partly on the shoulders of the owners were lost to the underwriters. Accordingly the three-quarters limitation has come to be usually omitted from the Collision Clause.

Court Definition of "Collision"

AFTER litigation extending over nearly three years, which one case was carried from the lowest courts to the highest in the State of New York, the Carroll Towing Company, Inc., has won out over the Aetna Insurance Company, and the word "collision" has received an authoritative definition, 196 N. Y. Supp. 698. Instead of meaning fortuitous contact between two vessels or other navigable objects, the court holds that "collision" means contact with or impact upon foreign bodies present in the water and is not restricted to mere collision with navigable objects.

Numerous court decisions were cited in support of the stand. One was the finding of Chief Judge Parker, 16 N. Y. 114; 57 N. E. 302, which was expressed as follows: "Collision, in its strict nautical and legal acceptance originally meant the impinging upon one another of vessels while being navigated, but in course of time and by common usage the application of the term has been so far extended in this country at least, as to include the impact of a vessel with other floating objects."

Judge Hough, in *Western Transit Co. vs. Brown* (D. C. 152 Fed. 476, said: "Neither is it denied that the word 'collision,' as used in marine insurance, can no longer be limited to that fortuitous contact of navigating vessels which is its obvious and natural signification."

SHIP SALES.—Eight steel tankers have recently been sold by the United States Shipping Board Emergency Fleet Corporation to the following companies: The *Hammac* of 9,980 deadweight tons to the General Petroleum Company, New York; the *Halo* of 10,078 deadweight tons to the City Service Company, New York; the *Tustem* and *Bohemian Club*, 9,799 deadweight tons each, to the Atlantic Refining Company, Philadelphia, Pa.; the *Devolente* and *Richconcal*, 10,000 deadweight tons each, to the Beacon Oil Company, New York, and the *Warwick* of 6,008 deadweight tons and the *Deroche* of 10,000 tons to the Union Oil Company.

Ann Arbor Car Ferry No. 3 Lengthened to Give 33 Percent Greater Car Carrying Capacity

THE Ann Arbor Railroad Company initiated the first lake car ferry movement known to transportation where sea operation was undertaken. The idea was conceived by them in 1890, and at that time they constructed two wooden car ferries, Nos. 1 and 2, which were placed in commission in November and December, 1892. These ves-

sel had a carrying capacity of approximately 24 freight cars, the cars being generally about 30 feet in length. The first steel car ferry, now known as the No. 3, was constructed and placed in operation in 1898, and in 1906 the No. 4 was put into service, the two wooden car ferries then being retired. In 1910 ferry No. 5 was built, and during 1917 ferry No. 6 was placed in commission. These vessels are so constructed and powered as to be able to navigate without difficulty during the winter as well as the summer months.

While the Ann Arbor Railroad Company established the first car ferry system on Lake Michigan in 1892, other railroads have since followed with service on several of the Great Lakes. Other points where long car ferry systems are now operated are on the Trans-Siberian, between Germany and Sweden, and by the Flagler system between Key West and Havana.

Ann Arbor car ferry No. 3, operating between Frankfort, Michigan, and Manitowoc, Wisconsin, recently left the plant of the Manitowoc Shipbuilding Corporation, where the vessel received extensive alterations. The ship was placed in a floating dry dock, cut in two, and lengthened 48 feet, giving it an increase in car carrying capacity of about 33 percent. The total length of the vessel is now 307 feet. New quarters for the crew were fitted on the upper deck in a new deck house, and increased passenger carrying capacity was provided.

NEW PROPELLING MACHINERY INSTALLED

During the lengthening operation, the old propelling machinery, consisting of two horizontal compound engines, and two natural draft Scotch boilers, were removed, and an entire new installation of modern propelling machinery was made. This consists of two triple expansion engines and two Scotch boilers 13 feet in diameter and 11 feet 6 inches long, carrying 180 pounds' steam pressure and operating under forced draft. The engines are of the vertical, three-cylinder,

direct-acting type, each developing 700 horsepower at 110 revolutions per minute and directly connected to outboard turning, four-bladed, solid cast steel propellers of sufficient weight to stand up under the severe ice conditions of winter service. As is usual on Great Lakes service, jet condensers are employed. The vessel is fitted with a very complete equipment of modern pumps, including ballast, feed, general service, sanitary and fresh water, and is lighted throughout by electricity supplied by two 10-kilowatt engine driven generating sets.

On her first trip after lengthening, the Ann Arbor No. 3



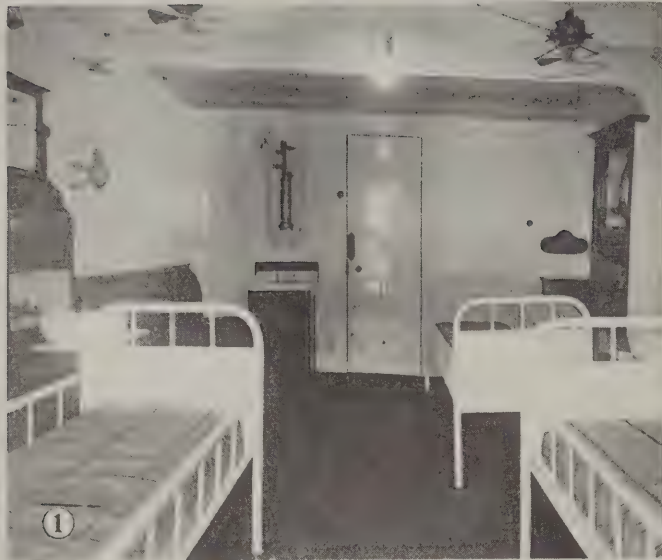
Lengthened Car Ferry No. 3 of the Ann Arbor Railroad

made the trip from Manitowoc to Frankfort, with 26 cars aboard, at a speed exceeding 13 miles per hour.



(Photograph by Kadel and Herbert, N. Y.)

Men of the United States Lighthouse Service Adjusting and Re-fueling a Buoy in Heavy Seas



S. S. Elisabethville: Interior Views of First Class Accommodations. (1) Hospital. (2) Writing Room. (3) and (4) Music Room. (5) Dining Room. (6) Smoking Room.

New Belgian Mail Ships for Service to Africa

Combined Passenger and Cargo Steamships Built to Relieve Heavy Traffic Demands to Belgian Colonies

THE combined passenger and cargo ships *Elisabethville* and *Thysville* put in commission a few months ago by the Compagnie Belge Maritime du Congo Mail-Boats were built and engined at Seraing, Belgium, by the Société Anonyme John Cockerill, to replace ships torpedoed off the French coast during the war. The increasing traffic demands between Belgium and her colonies in South Africa and along the Congo made necessary the addition of these two ships to relieve the other vessels of the Compagnie Belge Maritime du Congo Mail-Boats.

The principal dimensions of the steamship *Elisabethville* are:

Length between perpendiculars.....	440 feet
Breadth, molded	56 feet 10 inches
Depth, molded to shelter deck.....	37 feet
Draft	25 feet 3 inches
Gross tonnage	8,178
Displacement at load draft.....	13,250
Service speed	16 knots
Accommodations:	
First class passengers.....	180
Second class passengers.....	134
Officers	20
Crew	192
Total	526

The vessel is of the shelter deck type for carrying passengers and cargo and is classed 100 A-1 at Lloyd's under special survey. The watertight sub-divisions in the hull comply with the International Convention Regulations on Safety of Life at Sea. The ship has five decks. The watertight bulkheads are carried to the shelter deck and are fitted with doors operated both by hand and by the Stone-Lloyd hydraulic system. This system can be operated at the doors on either side of the bulkhead and from the navigating bridge.

The lifeboat capacity provides for every individual that will be carried. Welin davit equipment is supplied for all lifeboats.

PASSENGER ACCOMMODATIONS

Cabins for first class passengers are located on the bridge and shelter decks while the upper deck is devoted to second class passengers. The first class dining saloon is situated on the shelter deck forward of the engine and boiler casings and is reached by a double staircase from the first class lounge. Seating accommodations for 200 persons are provided. The second class dining saloon is situated on the same deck aft of the engine and boiler casings and has accommodations for 140 passengers. Other public rooms include first class lounge, first class smoking room, ladies' lounge and second class smoking room.

The first class lounge is in the shape of a large circular gallery lighted from above by a trunk, the ceiling of which is in the form of a stained glass dome embodying in design the signs of the Zodiac. Wainscotting panels and window frames are of polished oak, the curtain material used being mauve and gold silk. The uniformity of the panels is relieved by curved columns on which vases matching the urn-shaped light bearers at the four corners of the trunk are placed. The lounge is furnished with russet upholstered seats and chairs. In the space intended for the orchestra an allegorical oil painting forms an attractive background while against the surrounding panels sculptured panoplies of musical instruments are placed.

Leading from the lounge is the ladies' saloon ornamented

in the Louis XVI period. The panels in this saloon are of citron wood alternated with polished mahogany stanchions. Oil painted medallions framed with carved mahogany copied from masterpieces in the Brussels and Antwerp galleries adorn the walls. Window curtains and hangings are in gold and blue silk trimmed with design to match the uphol-



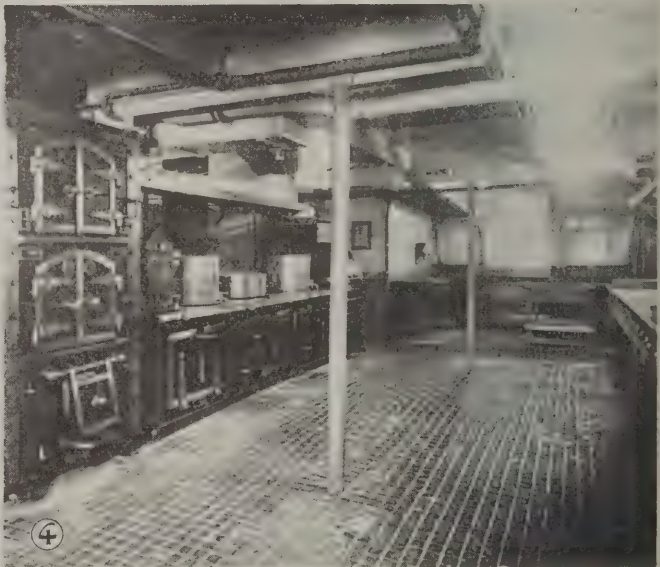
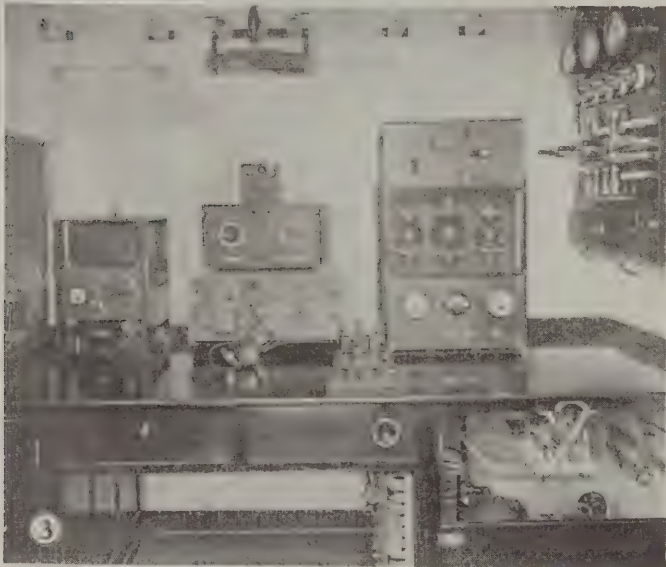
Well Over Dining Saloon

stery of seats and chairs which are trimmed with blue corded velvet.

A double stairway leads to the first class restaurant which is treated in white, the panels being relieved with decorated moldings. The furniture in the restaurant is upholstered in royal blue Utrecht velvet. The windows are decorated with cream moire and especially in the tropics a much appreciated effect of coolness is obtained.

The first class smoking room, situated on the bridge deck aft of the engine room is reached by a double flight staircase adorned with a stained glass window depicting the "Crocodile river" at Boma. The decoration of this space is of modernized Flemish style and the windows are framed with polychrome tiling. The center panel depicts the Halles of Ypres in a sepia tint while the others represent other Flemish landscapes. The furniture has antique leather coverings and the general effect is one of quiet and comfort.

Above the lounge is a series of staterooms with bathrooms adjoining. In these staterooms the furniture is of the Louis



S. S. Elisabethville: Interior Views. (1) Cabin de Luxe. (2) Captain's Cabin. (3) Wireless Room. (4) Galley. (5) Print Shop. (6) Hair Dresser's Shop.

XVI period of polished mahogany and matches the richly tinted carved panels and ceilings.

The same effect of luxury and comfort is carried out through the second class accommodations.

Throughout the entire ship the side lights and windows are fitted with mahogany blinds which are very essential while in the tropics for the same reason that those of the officers' quarters are fitted with mosquito proof copper wire gauze.

All of the woodwork and furniture was produced in the work shops at the shipyard.

PROPELLING MACHINERY

As noted the ships were engined by the Société Anonyme John Cockerill. The main propelling machinery consists of two sets of quadruple expansion engines developing 7,300 indicated horsepower which will give a normal speed of about 16 knots. The twin screws are of the built-up type each with three manganese bronze blades secured to the propeller bosses by Martin steel studs and gunmetal cap nuts. The bosses are of cast steel with cast iron cones fitted over the propeller nuts. All the main shafting is made of hydraulic forged ingot steel.

The ships are fitted with six Scotch single ended boilers working under a pressure of 215 pounds per square inch having a total heating surface of 14,100 square feet. These boilers were built by the Seraing Works of Cockerill and are arranged to work under Howden's forced draft system with two steam-driven fans.

AUXILIARY MACHINERY

The auxiliary machinery of the vessel includes the following:

Two circulating pumps of the centrifugal type, driven by compound engines, for circulating the water through the main condensers.

One auxiliary centrifugal circulating pump for the auxiliary contraflo steam condenser.

The feed pumps comprise two main double acting Weir pumps and one auxiliary double acting pump.

The evaporating plant consists of one Morison's radial evaporator with a capacity of 35 tons per 24 hours.

One general service pump of the vertical duplex type, which can be used for bilge suction, sanitary, feeding or circulating service.

One sanitary pump of the vertical duplex type.

One ballast pump of the vertical duplex type.

One fresh water pump of the vertical duplex type for washing and drinking purposes.

One distiller, Quiggin's Patent, with a capacity of 150 gallons per hour.

One underline hydraulic ash expeller of the Stone system.

The refrigerating plant consists of:

Two simplex vertical machines of Hall's type with a capacity of 4 tons of ice per 24 hours.

One CO₂ duplex evaporator.

Two independent brine pumps.

Two circulating pumps for the CO₂ condenser.

Total capacity of refrigeration chambers, 13,000 cubic feet.

ELECTRIC PLANT

Each vessel is equipped with three sets of 30-kilowatt dynamos driven by compound engines. An emergency unit, consisting of a 10-kilowatt dynamo driven by a Parsons type motor is installed.

The wireless equipment consists of two independent sets, one a quenched spark set having 1½ kilowatts capacity and the second a continuous wave set having 1½ kilowatts capacity. The maximum effective range of each set is 2,500 miles. The type of continuous wave set employed is particularly adapted to ship work because of its rugged construction, simplicity and rapidity of operation. Power for this transmitter is supplied by a motor generator on the upper deck and controlled from the wireless cabin. An emergency transmitter

is also installed, current being supplied from an independent accumulator battery of ¼ kilowatt capacity. This set has a main range of 220 miles.

The latest type Marconi direction finder is also installed. This instrument is used for taking bearings at a distance of 400 to 500 miles.

Derrick Barge Designed for Excavation Work

A GENERAL service derrick barge, designed for the Kelly Axe Manufacturing Company, Charleston, S. C., by Cox and Stevens, naval architects, New York, has recently been constructed by the Charles Ward Engineering Works, Charleston, W. Va.

The barge is primarily intended for excavating a lagoon at the company's works to form a harbor for the floating equipment owned by the organization. Later the barge is to



Derrick Barge Equipped with Steam Locomotive Crane

be used for loading and unloading steel material, for handling hickory logs obtained on the Tennessee, Cumberland and Green rivers and also for unloading barges at various points on these rivers where the finished products are delivered.

The length of the hull is 42 feet, the breadth 30 feet and the depth 5 feet. The draft when fully loaded is only 34 inches. The hull is of steel construction throughout, one end having a rake aft to facilitate towing. The opposite end of the hull is square and here two anchorage spuds have been placed.

The barge is equipped with one No. 4 type "H" Brown Hoist Company's steam locomotive crane with a structural base. The maximum reach of the crane boom, when in its lowest position, is 38 feet beyond the end of the hull. It has a capacity at 19 feet 6 inches radius of 22,250 pounds and at 57 feet radius of 5,200 pounds. The hull in the way of the foundation for this crane was made into a watertight

compartment to provide a fresh water tank for boiler feed water. On deck a portable coal box is provided having a capacity of 3 tons. When the fuel is to be replenished the coal box is swung ashore by the crane, filled and returned to its place on the deck.

Scout Cruiser Omaha Goes Into Commission

THE new scout cruiser, *Omaha*, the first of ten sister ships being built for the United States Navy, successfully completed her official trial on Puget Sound, and on February 24 was put into commission at the Bremerton Navy Yard.

As the highest powered vessel ever to sail under the American flag, this ship, with only one-half of the boilers in use, and these at only two-thirds of their capacity, went through the water at a speed that would take her across the Atlantic in less than four days. With all of the boilers in use a speed will be developed which would enable the vessel to cross the Atlantic in three days.

For two hours, as directed by the Naval Board of Inspection and Survey, headed by Captain Decker, runs were made over a measured mile course at $26\frac{1}{2}$ knots, and then for four hours a straight course was held from Tacoma to Port Townsend and back at a speed in excess of 27 knots, reaching $27\frac{1}{2}$ knots, or in excess of 31 miles per hour, for some of the time.

The ship was manned by a crew from the Todd Dry Dock and Construction Corporation, builders of this cruiser, and of two sister ships, the *Milwaukee* and *Cincinnati*, which will shortly follow her from the yard. No attempt was made to obtain the highest speed possible even with only half of her boilers in use, and in fact it was only required that a speed of 25 knots be maintained for the six hours.

The absence of vibration and motion usually associated with traveling on the water at 30 miles an hour was particularly noticeable. When at lunch, out of sight of the water, it was difficult to tell whether one were afloat or in a room ashore, except that there was no rumbling and shaking from passing trucks and trolleys.

After the completion of the trials the *Omaha* proceeded to Bremerton where Captain David S. Hanrahan, a noted destroyer skipper, took command with Lieutenant Commander H. T. Smith, who had spent some time at the builder's yard during construction, in charge of the engine rooms. A crew picked from the destroyer force came aboard and will be trained to operate the machinery and handle the ship in service.

In addition to the trial board, Captain Hanrahan, Lieutenant Commander Smith and other officers who will form part of the personnel, representatives of the builders of the ship, and of the machinery were aboard during the trial, and all expressed satisfaction with the performance and appearance of all portions of the work.

Designed for a speed of over 33 knots, the *Omaha* was built at Tacoma, Washington, by the Todd Dry Dock and Construction Corporation. There are 12 watertube boilers constructed by the Union Iron Works at San Francisco, equipped with Babcox and Wilcox fuel oil burners, each boiler capable of producing 125,000 pounds of steam an hour. This means that each hour all twelve boilers can turn 700 tons of water into steam, or more water than could be carried by ten of the largest locomotive tenders.

Each of the four propellers is driven by a 25,000 horsepower cross compound Westinghouse turbine and reduction gear. When at full speed the turbines revolve at 2,500 revolutions a minute, and this speed is reduced by means of the flexible frame gears to 370 revolutions per minute of the propeller shaft. At 26.4 knots it was estimated that the

propellers would revolve at 251 turns per minute; the actual trial came within less than one percent of this amount, showing the remarkable accuracy of the design.

The one hundred thousand horsepower installed for propelling this ship, besides being the greatest afloat under the American flag, makes this plant one of the most powerful for any purpose in the country. Few cities have power plants for lighting or operating the street railways of greater power.

A conception of the power of the *Omaha* is obtained by comparing it with our largest battleships with only one-third, and the mighty *Leviathan* with two-thirds the power installed in the *Omaha*.

It is not only important that these vessels be able to travel at express speed but they must be capable of going a great distance at the relatively slow speed of 10 to 15 knots. While the power needed at full speed will be 100,000 horsepower, at 12 knots it will only be 2,000, or 2 percent of the full power. In order to obtain a high efficiency at this small power cruising turbines are installed. These consist of small high speed turbines of the Westinghouse re-entry impulse type, with reduction gears which connect by means of a suitable clutch to the shafts of the main high pressure turbines.

By means of these cruising turbines it will be possible to operate the propelling machinery at 12 knots so efficiently that with a given expenditure of fuel the ship can steam over forty times as long, or fifteen times as far as at full speed.

Shipping Board Report on Foreign Commerce Issued

DIRECTOR R. T. Merrill of the Bureau of Research, United States Shipping Board, announces that the Bureau has completed its annual report of the water-borne foreign commerce of the United States, for the fiscal year, July 1, 1921, to June 30, 1922. This report shows the actual tonnage of cargo handled at the port, the amount and character of the principal commodities and their ports of destination, and origin. A previous report issued by the Bureau covered the cargoes entered and cleared at the principal ports of the United States, but did not show the ports of original loading or final discharge and therefore could not serve as a criterion of the actual port activities.

This report applies solely to trade between the United States and foreign countries, and is compiled primarily to aid the Shipping Board in its task of building up American flag services on essential trade routes. Because it does not include coastwise or intercoastal movements, it cannot be taken as a measure of the total activities of the individual ports. This is especially true of the ports having large coastwise movements and a small amount of foreign trade.

The growth of the intercoastal business, supplementing our already large coastwise trade, has been phenomenal and is especially noteworthy in the last six months. Were the figures of this movement included, there would be marked changes in the standing of many ports, particularly those of the Pacific coast.

Another feature of interest is the standing of certain ports due to one, or at the most two, predominating commodities. For example, it will doubtless be surprising to see Port Arthur, Texas, standing in the position it occupies. This rank is due wholly to its trade in petroleum, most of which, during the period shown, came from the Mexican fields. Later developments in oil production are tending to shift the center of production from the Mexican fields to southern California and, although a large part of its output will move to the East Coast by water, it is probable that a sufficient quantity will be exported from the Pacific fields to foreign countries to change markedly the standing of southern Californian ports in the next year.



One of the Shipping Board's 535-Foot Passenger Steamships

Performance Standards Established by Shipping Board for 535-Foot Passenger and Hog Island Cargo Vessels

THE Fuel Conservation Committee appointed by Vice-President Joseph E. Sheedy of the United States Shipping Board, which consists of Captain C. A. McAllister, Captain R. D. Gatewood, (C.C.) U. S. N.; Colonel George Bartlett, E. H. Peabody, D. M. Myer, Major G. M. Talbot, Maurice Healey, F. B. Webster, and C. J. Jefferson, head of the Fuel Conservation Section, is continuing the work of establishing the standards of performance for the active vessels of the United States Shipping Board fleet. The methods employed in establishing these standards were outlined on page 783 of our December, 1922, issue, the first set of standards established being for the 502-foot ships.

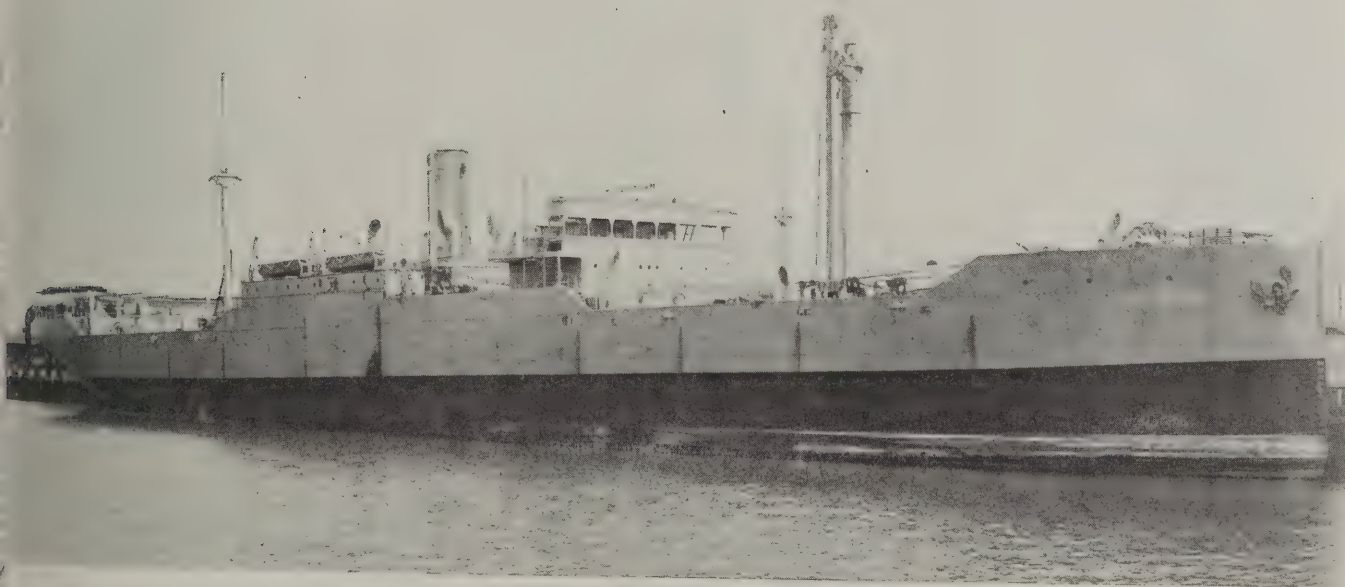
The standards for the 535-foot passenger vessels and also for the large fleet of cargo vessels built by the American International Shipbuilding Corporation which are referred to generally as the Hog Island vessels have been completed and

are being used by the various operators as a means of determining the efficiency of performance of the vessels of this class which they are operating.

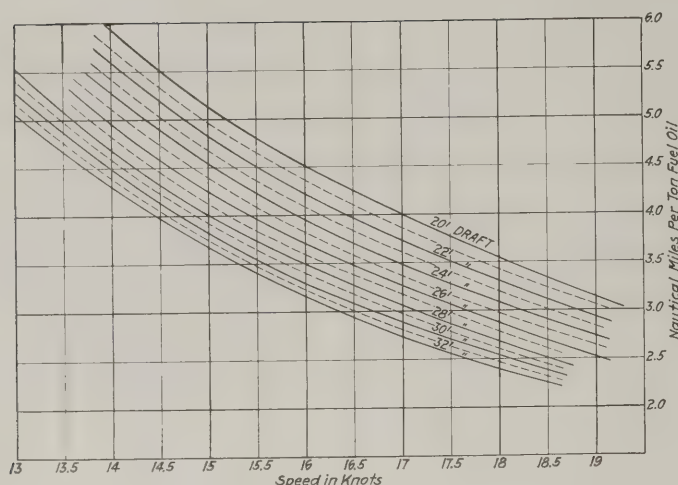
535-FOOT PASSENGER VESSELS

The 535-foot passenger vessels have been subdivided into three classes and a set of performance curves developed for each class. These curves give the miles per ton of fuel which the vessel should make at a given draft and speed with moderate weather and average bottom conditions. They do not, however, represent impractical theoretical values but rather the values that have been obtained by several of the vessels of the class with the equipment and operating personnel working efficiently.

All of the 535-foot passenger vessels have the following characteristics:



Hog Island Type Cargo Steamship



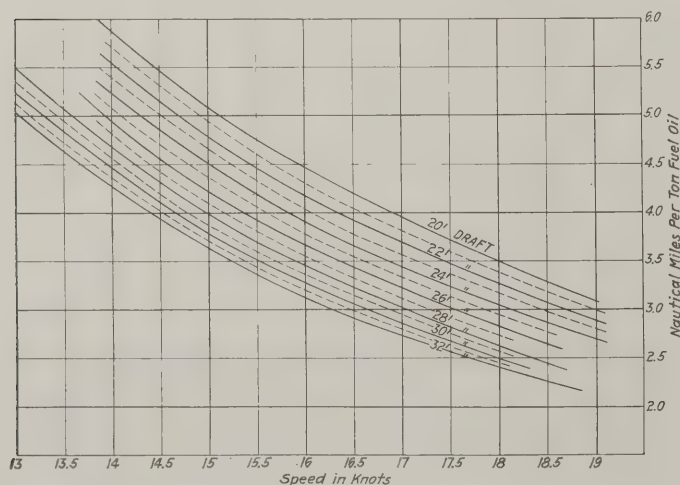
Performance Standardization, 535-Foot Passenger and Freight Steamships

S. S. President Taft, President Pierce, President Grant, President Cleveland, President Jackson, Pan America, Western World.

Length overall	535 feet
Breadth	72 feet
Depth	50 feet
Loaded draft	30 feet 7 inches
Deadweight tonnage.....	11,310
Speed, knots.....	17.5
Engines.....	2 cross compound turbines
Boilers.....	8 watertube or tubular

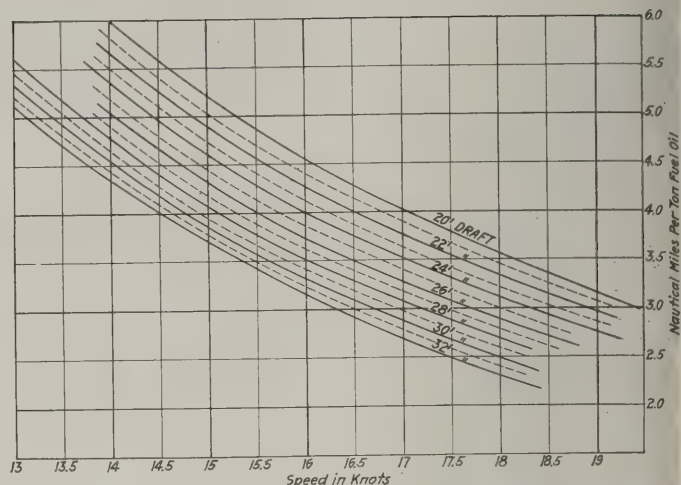
The first of these three classes consists of the steamships *President Taft*, *President Pierce*, *President Grant*, *Pan American*, *Western World*, *President Cleveland* and *President Jackson*. These vessels are all fitted with similar propellers. The first five were built by the Bethlehem Shipbuilding Corporation, and are equipped with Fore River turbines and Yarrow boilers. The last two were built by the Newport News Shipbuilding and Dry Dock Company, which also built the turbines for these two vessels. These have Babcock and Wilcox watertube boilers.

The second class consists of the steamships *President Harding*, *President Roosevelt*, *President Madison*, *President McKinley*, *President Wilson* and *President Lincoln*. They were built by the New York Shipbuilding Corporation and have similar propellers and are equipped with Fore River turbines and Babcock and Wilcox boilers.



Performance Standardization, 535-Foot Passenger and Freight Steamships

S. S. President Harding, President Roosevelt, President Madison, President McKinley, President Wilson and President Lincoln. Built by New York Shipbuilding Corporation and equipped with Curtis turbines.



Performance Standardization, 535-Foot Passenger and Freight Steamships

S. S. President Jefferson, Southern Cross and American Legion. Built by New York Shipbuilding Corporation and Equipped with Westinghouse turbines.

The third class consists of the steamships *President Jefferson*, *Southern Cross* and *American Legion*. These three were built by the New York Shipbuilding Corporation and are fitted with Westinghouse turbines and Babcock and Wilcox boilers.

From the tabulated performance of these vessels it was found that the efficiency of performance varies from 98.8 to 62.7 percent for the various vessels. Eight of the 16, however, showed over 90 percent efficiency and all except two, which on their earlier voyages were subjected to inefficient and poor operation, showed over 80 percent, the average for the entire class being 87 percent.

The general average performance for all the 535-foot passenger vessels, as shown by this tabulation, is as follows:

Draft	R.P.M.	Observed speed, knots	Tons fuel per 24 hrs.	Pounds fuel per mile	Knots per ton		
					A, Actual	B, Theoretical	A Correction Factor
24' 5 1/8"	113.9	16.9	133	725	3.08	3.54	0.870

HOG ISLAND CARGO VESSELS

The standards for the Hog Island cargo vessels are of greater interest to the average operator as they are applied to the type of vessel which is the backbone of the merchant marine, for, after all, it is the cargo carrier which affects the greater part of our population, as this type of vessel carries the products of the Middle West, the products of the manufacturing centers and, in fact, the greater part of the whole country's foreign commerce. It is essential that these vessels be operated efficiently, if the American merchant marine is to be made possible.

The tabulation of the performance of these vessels shows efficiencies from 58.7 to 107.8 percent with an average of 83.67 percent for the entire class. The vessels of this class are practically identical and have the following characteristics:

Length between perpendiculars.....	390 feet
Breadth	54 feet
Depth	32 feet
Loaded draft	24 feet
Deadweight tonnage	7,840
Speed, knots	11
Engine.....	1 General Electric turbine
Boilers.....	3 Babcock and Wilcox watertube

Why should there be such a difference in the efficiency of performance? It has been found, as the individual cases have been taken up by the committee, that it generally hinges on the efficiency of the operating personnel and the attention which has been paid to the details of operation. In the one

case, the vacuum system is tight and the vessel is developing full power with minimum fuel. In the other case, there are leaks in the system and the power falls down and the fuel consumption goes up. It is a problem of correcting details which must be met by the operating force and the attention which is paid to these details is reflected immediately in the efficiency of performance.

An example of this can be taken from the tabulation compiled by the committee. The worst performers immediately became problems for the committee to attack and it is gratifying to note that the worst performer has shown on a voyage completed since the standards have been put into effect an increase in efficiency of approximately 30 percent which gives this vessel a rating somewhat above the average of her class.

The general average performance of 70 Hog Island type cargo vessels, as tabulated by the committee, is as follows:

Draft	R.P.M.	Observed speed, knots	Tons fuel per 24 hrs.	Pounds fuel per mile	Knots per ton		Percent efficiency
					Actual	Theoretical	
21' 8 7/16"	80.6	10.33	29.14	26.33	8.51	10.17	83.67

The figures and curves cannot in themselves increase the efficiency of performance of the various vessels, but they do give the operators a definite target to shoot at and, in attempting to hit the standard, the increased efficiency and reduced fuel bill will be accomplished; in that way they serve their purpose and help to maintain an American merchant marine.

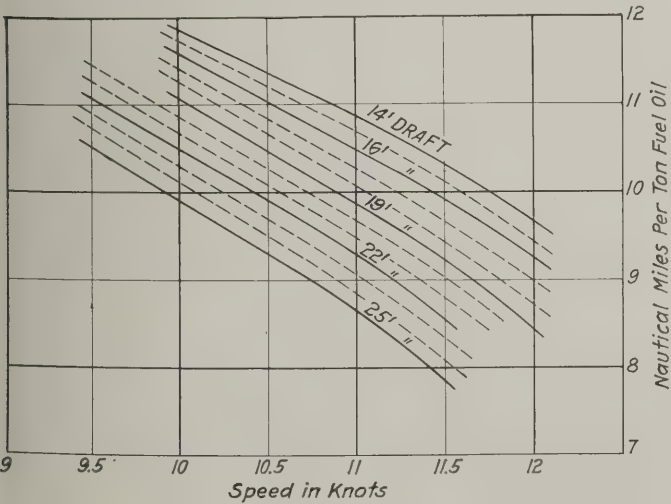
INSTRUCTIONS FOR USING PERFORMANCE STANDARDIZATION CURVES

The curves on the performance charts show the number of nautical miles that a ship should travel on a ton of fuel for various speeds and drafts, and have been adopted as a standard for the ships as designated.

In arriving at this standard, due consideration was given for the increase in power required to drive the ship at sea over that required under trial trip conditions, and the increased steam consumption of the machinery at sea over that on tests. It is not expected that the ship will do as well on every voyage, as the curves show, as rough weather would decrease the mileage, yet in smooth seas the showing should be better, and the average performance should be equal to the standard, providing the ship and equipment are in proper condition, and properly operated.

The procedure for obtaining the performance of a ship on a voyage is as follows:

Divide the distance (in nautical miles) traveled by the fuel (in tons) consumed. This will give the actual nautical miles per ton of fuel.



Performance Standardization, Type "A" Steamships Built at Hog Island, and Equipped with Curtis Turbines

From the chart find the standard nautical miles per ton of fuel for the draft and speed on this voyage as follows:

On horizontal base line pick out average speed of voyage and run up this line in vertical direction until it intersects the curve corresponding to average mean draft, from this point follow over on horizontal line to read the miles per ton of fuel which represents standard performance.

Divide the actual performance by the standard and multiply by one hundred. This will give the percentage performance for the voyage.

Example: To find the percentage performance of a ship on a voyage.

For this we will take one of the 7,500 deadweight ton ships built by the American Shipbuilding Corporation, known as Hog Island type "A" ship.

Mean draft on leaving port.....	24 feet 0 inches
Mean draft on arriving.....	23 feet 0 inches
Mean draft on voyage.....	23 feet 6 inches
Distance traveled	3,000 nautical miles
Fuel consumed	310 tons
Speed	10.2 knots

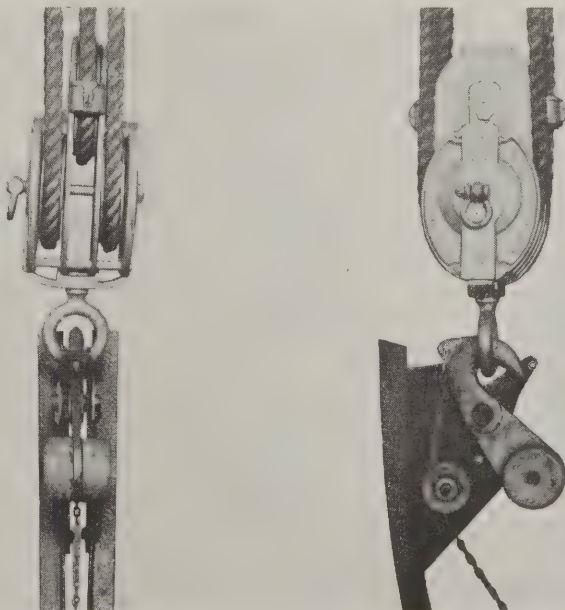
Actual nautical miles per ton of fuel $\frac{3000}{310} = 9.68$.

Standard nautical miles per ton of fuel for 10.2 knots and 23 feet 6 inches draft (from curves) = 9.95.

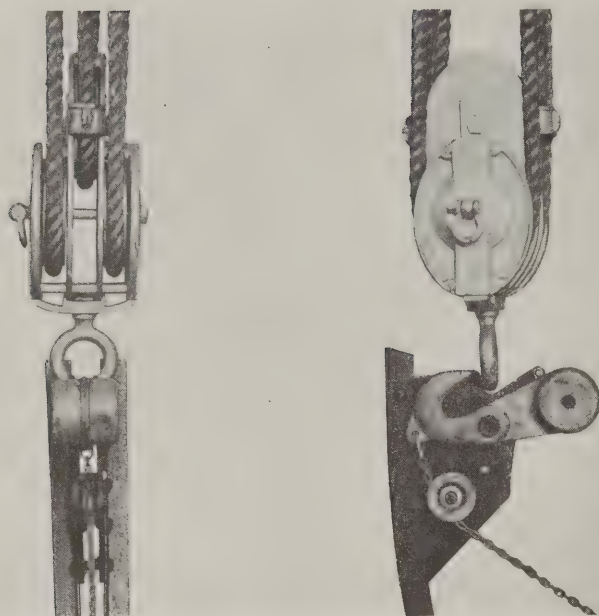
Percentage performance = $\frac{9.68 \times 100}{9.95} = 97$ percent.

Improvements Made in Welin Marine Type Mills Releasing Gear

THE Welin marine department of American Balsa Company, Inc., Long Island City, N. Y., has recently succeeded in still further simplifying and making more reliable the Mills releasing gear, which has been on the market for twenty years. The number of parts has been reduced by so designing the supporting plate that it also acts as a guide for the eye of the block or shackle, thus making an end deck and guide casting unnecessary. In this new design all of the parts subjected to strain are made of wrought material and, as a result of this, the new design complies with the rules of the British Board of Trade as well as with the rules of the United States Steamboat Inspection Service.



End and Side Views of Gear in Locked Position



End and Side Views of Gear Unlocked for Release of Boat

These improvements in the Mills releasing gear have accomplished:

1. A gear with reduced number of parts and, because of this, of less cost to manufacture.
2. None of the parts subjected to strain is made of cast material.
3. A gear that is simple to install and easy to operate.
4. A gear with limit stops which make it positive of action.

This new type of gear is adaptable to installation in any type of lifeboat and, for the sake of safety, releases only when the boat is water-borne.

Vessel Tonnage Turned Out in Great Britain the Lowest in 30 Years

BRITISH ship production during the year 1922 represented a shrinkage of 50 percent since 1920, and made the poorest record for more than 30 years, says Commercial Attache W. S. Tower in a report to the Department of Commerce. The British merchant fleet is now only slightly larger than it was in 1914. About 98 percent of the increase in world tonnage since 1914 has been under flags other than British, and from controlling close to 45 percent of world merchant steam tonnage the British share has dropped to about 33 percent.

The course of ocean freights and time charter rates explains the reluctance to acquire more tonnage. The average ocean freight rate for 1922 declined 20 percent from the average for 1921, and the average of time charters showed a decline.

Prices for 7,000 to 9,000-ton ships, according to recent contracts, are said to range for £8 10s. to £9 10s. per dead-weight ton, a drop of at least £2 per ton since July, £4 per ton since January, and close to £10 per ton in the last 18 months. The reduction has been made possible largely by drastic wage cuts and by lower prices for materials.

Vessels entering British ports with cargo during 1922 show a tonnage increase of 15 to 20 percent over 1921. For clearances with cargo the showing is far better, the average monthly tonnage in the last quarter of the year being almost 40 percent larger than for the corresponding period of 1921.

This increase of activity was promptly reflected in a decrease of idle tonnage in British ports. The decrease from quarter to quarter since July 25, 1921, is shown in the accompanying table.

TONNAGE OF VESSELS LAID UP IN BRITISH PORTS

Date	British Flag		Foreign Flag		Total	
	No.	Net tons	No.	Net tons	No.	Net tons
July 25, 1921.....	883	1,650,788	140	201,624	1,023	1,852,412
October 25, 1921.....	654	1,158,425	88	137,811	742	1,296,236
January 1, 1922.....	621	1,179,548	91	128,045	812	1,307,593
April 1, 1922.....	422	734,240	62	102,379	484	836,619
July 1, 1922.....	533	1,025,662	50	86,670	583	1,112,332
October 1, 1922.....	419	752,469	37	72,155	456	824,624
January 1, 1923.....	371	671,886	40	60,312	411	732,198
(Preliminary)						

Propelling Machinery of the New White Star Liner Doric

MUCH interest is being manifested in steamship engineering circles over the engine equipment of the new *Doric*, which is now completing at the Harland and Wolf yards at Belfast to enter the service of the White Star Dominion Line between Montreal and Liverpool. The *Doric* is scheduled to start her maiden voyage from Liverpool on May 11, and will sail on her return trip from Montreal May 26. She is a sister ship of the *Regina* and *Pittsburgh*, both completed in 1922, and like the other two was built particularly for the one cabin passenger trade. Her gross tonnage is 16,500, and length and breadth 600 feet and 68 feet respectively.

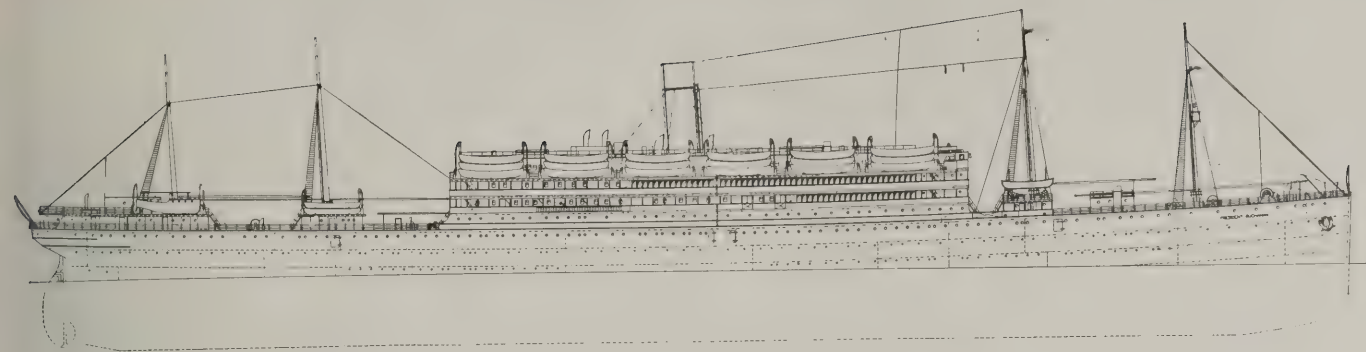
The *Doric's* main machinery consists of two sets of Brown-Curtis single reduction geared turbines driving one port and one starboard propeller. Each set comprises one high pressure turbine which exhausts to one low pressure turbine and thence to the condenser. The power is equivalent to about 4,500 horsepower for each, thus making a total for the ship of about 9,000 horsepower. An astern turbine is incorporated in the low pressure casing.

The ahead and astern control or maneuvering wheels are mounted on the high pressure turbine. It is interesting to note that all the bearings are worked under forced lubrication, and in the case of the gearing the oil is discharged through sprayers onto the teeth. Should the supply of oil fail through any cause, the steam from the boilers is immediately checked by the operation of a patent governor, which also shuts off in the case of excessive rotor speed.

The rotors of these turbines are each connected to its pinion by a flexible coupling, and the pinions mesh with the main gear wheels mounted on the main or propeller driving shafts. The rotors have speeds of about 1,640 revolutions per minute at the high pressure and 1,400 at the low pressure, which correspond respectively to peripheral speeds of 365 and 472 feet per second. As the propeller revolves at a speed of 100 revolutions per minute this gives a reduction from the high pressure turbines to propellers of about 16½ to 1. The main gear wheels, 12 feet in diameter, weigh about 36 tons each, and contain 671 teeth of 7/12-inch pitch cut in double helical style in order to neutralize end thrust.

The outside dimensions of the complete gearing are 11 feet by 14 feet by 15 feet, and the total weight amounts to 74 tons. The teeth of one gear wheel are cut at an angle of 30 degrees on a specially constructed machine, and the operation took altogether a full month to complete. To obtain a good face of tooth it was necessary to keep the machine running continuously day and night, as a stoppage might cause an imperfection in the cut of the wheel and thus affect its contact with the pinion.

Each of the vessel's low pressure turbines weighs about 40 tons. It is interesting to note that in the four turbines there are 35,500 phosphor bronze impulse blades, which, if placed end on end, would extend for a distance of three miles. The rotors are of forged steel, the casings of cast iron, and the plates for directing steam on to the moving blades are of nickel steel cast into an iron frame or diaphragm. Steam is supplied from the boilers at a pressure of 215 pounds per square inch.



Outboard Profile of Steamship President Buchanan as She Will Look After Reconditioning

The Reconditioning of the President Buchanan

Unusually Complete Plans and Specifications Prepared to Convert
Ex-German Liner Into One of the Largest of Cabin Class Vessels

THE *President Buchanan*, built in 1907 at the shipyards of Harland and Wolff, Belfast, is to be converted into one of the largest and best cabin ships afloat. The specifications and plans prepared by the Gibbs Brothers, New York, who performed the same task on the *Leviathan*, are so complete that little or nothing will be left to the imagination of the successful contractors. As will be seen from the illustrations, the drawings are of the working rather than the contract type, which means that a great saving will be made in the time that it will take to do the work.

The work on the *President Buchanan* is looked upon as the most extensive reconditioning job brought out so far this year. The bids on the work are expected to be opened on April 2 and it will then probably take from 128 to 180 days to complete the job. It will be noticed from the outboard profile that the appearance of the ship will be changed considerably as the bridge house has been elongated necessitating the removal of two masts.

The amount of money required to convert this steamship into a revenue paying vessel capable of carrying 2,141 passengers will probably be well over \$1,000,000. Even a brief perusal of the principal changes to be made as outlined below will convince anyone of the magnitude of the undertaking.

REMOVAL OF EXISTING ACCOMMODATIONS

The whole of the existing joiner work, furniture, fittings and fixtures of the original first, second, third and fourth class passengers and of the officers and crew accommodations will be renewed. This includes all public rooms, staterooms, open berthing spaces, lavatory and toilet spaces, dining saloons and messrooms, galley and pantry compartments, hospital spaces, storerooms, etc. The ship's dry and wet provision storerooms, however, on *H* deck will be retained and reconditioned.

New accommodations for all cabin passengers will be constructed and equipped. They will be fitted out completely and extend from *A* to *G* decks. This will consist of about 200 two-, three- and four-berth rooms, a social hall and writing room, a ladies' saloon, a smoking room, a veranda, a gymnasium, a dining saloon seating 380 persons, lavatory and toilet spaces and bathrooms including 12 private baths, a galley, a pantry, two bakeries, a bread room, a butcher shop, deck stewards and service pantries with direct access to main pantry.

The existing main stairway from frames 114 to 118 will be replaced with a stairway of different type which will

permit it to be fitted with fire-resisting inclosures on the several decks, and an additional main stairway will be constructed from frames 90 to 96 running from *G* to *A* decks and fitted within a watertight inclosure on *E* deck and fire-resisting inclosures on *A*, *B*, *C*, *D* and *F* decks. Fire screen bulkheads of approved construction will be fitted within this accommodation, their spacing not to exceed 130 feet. The engine and boiler casings passing through this accommodation will be efficiently insulated.

NEW THIRD CLASS PASSENGER ACCOMMODATIONS

The new accommodations for approximately 1,424 third class passengers will be constructed and fitted out completely in the space extending from *D* to *G* decks. They will consist of approximately 364 two, four and six berth rooms, 3 general rooms, 2 smoking rooms, a dining saloon in six sections having a seating capacity of 700 persons, combined lavatory and toilet spaces, bathrooms and washrooms, laundries, a galley, a pantry, an auxiliary pantry, two hospital compartments with bathrooms attached, an operating room, a dispensary, two isolation hospitals with bathrooms attached, two disinfecting rooms, a canteen and linen office together with required stairs, ladders and companion hatches.

OFFICERS' AND CREWS' ACCOMMODATIONS

New accommodations for about 350 officers and crew will be constructed and fitted out completely in the spaces from *A* to *G* decks. They will consist of staterooms for officers and petty officers, berthing space for crew, officers' messrooms, pantry, a crew's galley, lavatory and toilet spaces, bathrooms and shower baths and a hospital together with required stairs and ladders.

EXTENSION OF SUPERSTRUCTURE

The midship bridge house structure at *A*, *B* and *C* decks will be extended forward to frame 73½ and *A* deck with its house aft to frame 168. Within this extension a portion of the new passenger and crew accommodations will be arranged. These extensions necessitated the removal of the existing deck house on *D* deck between frames 73 and 98 and also the elimination of two existing cargo hatches between frames 82 and 104 which pass through *D*, *E* and *F* decks and the one cargo hatch between frames 153 and 157 through *B* to *F* decks inclusive.

The existing pilot house and chart house will be removed and replaced with a teak house of slightly larger dimensions.

General Data: Passenger and Cargo Steamship President Buchanan

General Information

Service: North Trans-Atlantic Passenger Service.
Builder: Harland & Wolff, Belfast. Built in 1907.
Owner: U. S. Shipping Board.

Characteristics

Length, overall 615' 3"
Length, B. P. 600' 0"
Breadth, molded 68' 0"
Depth, molded to "D" deck 52' 0"
Draft, loaded 33' 0"
Block coefficient, approx. 0.76
Speed, loaded, knots, normal 13½ knots
Framing, transverse, spaced 30½"
Class American Bureau of Shipping

Tonnages

(In tons of 2,240 pounds)
Displacement at 33' draft 29,250
(In tons of 100 cubic feet)
Gross register when reconditioned 18,400
Net register when reconditioned 13,500

Complement

Deck officers 8
Deck crew 15 petty 36 seamen
Engineer officers, incl. deck engineers 14
Engineer crew 43
Purser's and steward's department 238
Total officers and crew 354
First-class passengers 717
Second-class passengers none
Third-class passengers 1,424
Total passengers 2,141
Total complement 2,495

Life Saving Equipment

Lifeboats	No.	Type	Length
Metallic	2	1-A	24'
Metallic	36	1-A	30'
Metallic	4	1-A	26'
Motor	2	...	30'

Propelling Machinery
Boilers

Number 4 D.E. and 2 S.E.
Type Scotch
Length D. E.—19' 0" S. E.—10' 9"
Diameter D. and S.—15' 6"
Fuel Oil
Draft Howden Forced
Total heating surface, square feet 23,503
Total grate surface or furnace volume 567
Superheat, degrees F.
Working pressure, lbs. per sq. in. 215

Engines

Number 2
Type 4-Cyl. Quad. Expansion
Size 25 x 36 x 52½ x 75 x 54
Horsepower 7,500 I. H. P.

Refrigerating Machinery:

Two 15-ton York CO₂ Compressors
Two CO₂ Condensers
Two Evaporators
Brine and Circulating Pumps.

Electric Equipment:

Generators Turbo, 3, 200-kw.
Radio
Emergency Diesel Generator, 1, 50-kw

Bunkers

Compartment	Tons
Total fuel bunker capacity	3,130

Auxiliary Machinery

Condensers, main, surface type, 1,671 tubes each, diameter, ¾ inch, length of tubes, 18 feet... 2
Condenser, auxiliary, to be replaced 1
Air pumps, main, attached to main engines... 2
Bilge pumps, attached to main engines 2
Water service pump, attached to main engine... 1
Sanitary pump, attached to main engine 1

Main circulating pumps 2
Main feed pumps, Weir type, 14 1/16 inches by 9½ inches by 27½ inches, drawing water from common float tank located beside pumps and discharging into feed pipe before passing through feed heater 2
Auxiliary feed pumps, vertical simplex 1
Vertical duplex
(Either pump will handle all requirements)
General service pump, simplex type, size 17½ inches steam end by 11 inches water end by 19 inches stroke 1
Ballast and fire pumps, duplex double acting, 9 1/16 inches by 10 7/32 inches by 14¾ inches 1
Ballast and fire pumps, duplex, 10½ inches by 7½ inches by 12 inches 1
Bilge pump, vertical duplex 1
Auxiliary feed pump, 7 inches by 5 inches by 12 inches 1
Fresh water pumps 4
Main sanitary pump 1
Auxiliary sanitary pump 1
Fuel oil pumps, vertical simplex, 2 inches, each pump room 4
Fuel oil heaters 2
Fuel oil transfer pumps, one in each pump room, 7½ inches by 9 inches by 10 inches 2
Oil burners 30
Evaporator, vertical multi-coil type 1
Distiller, vertical multi-coil type 1
Feed water heater, multi-coil type 1

Deck Machinery

Steering gear, consisting of two compound vertical engines controlled by hydraulic telemotor 1
Anchor windlass, also used for warping 1
Winches 18

Machine Shop

Lathes 3
Drill press 1
Drill press, electric portable 1
Emery wheels 2
Hand pump press 1
Electric motor 1

This will make it necessary to move the navigating bridge structure to suit the new house.

REARRANGEMENT OF PILLARS AND GIRDERS AND REMOVAL OF STRUCTURAL BULKHEADS

Where existing pillars, girders or bulkheads interfere with the arrangement of the new accommodations, or with proper access to them, they will be removed and re-located in such a manner as to obviate interference. This means that in several places existing steel bulkheads not fitting in with the new arrangement will be removed but where such bulkheads act as supports for decks, suitable pillars or other structure will be substituted.

NEW WATERTIGHT BULKHEADS

Two new main watertight bulkheads will be installed, one at about frame 77 extending from *G* to *D* decks and the other one at about frame 189 extending from the inner bottom to *D* deck. Where watertight bulkheads are modified or re-located, the decks forming watertight flats in way of them will be reconstructed to maintain the watertightness of the compartments. All watertight bulkheads shall comply with the requirements of the American Bureau of Shipping to withstand a test head of water to *D* deck. As the new watertight bulkhead at frame 189 divides the existing cargo refrigeration compartment on *H* deck into two parts it will be necessary to make changes in the insulation, piping and similar details.

AIR PORTS AND FIXED LIGHTS

All existing air ports and fixed lights below *E* deck within passenger and crew accommodations and storeroom will be removed and replaced with 10-inch clear glass fixed lights fitted with dead covers. Additional ports and lights will be fitted as indicated on the contract plans. At *E* deck the existing 12-inch and 14-inch clear glass air ports will be retained

but all those in the cabin, dining saloon, galley and pantry compartments will be made 14 inches. Laycock frameless lights shall be fitted in the *B* and *C* promenade deck spaces as shown on the plans.

DINING SALOON

The dining saloon will be completely reconstructed and rearranged so that more expeditious service can be provided for the passengers. In this connection, the galley equipment will be improved and modernized in every way, including the installation of an entirely electric cooking apparatus, ranges, etc.

DECK COVERINGS

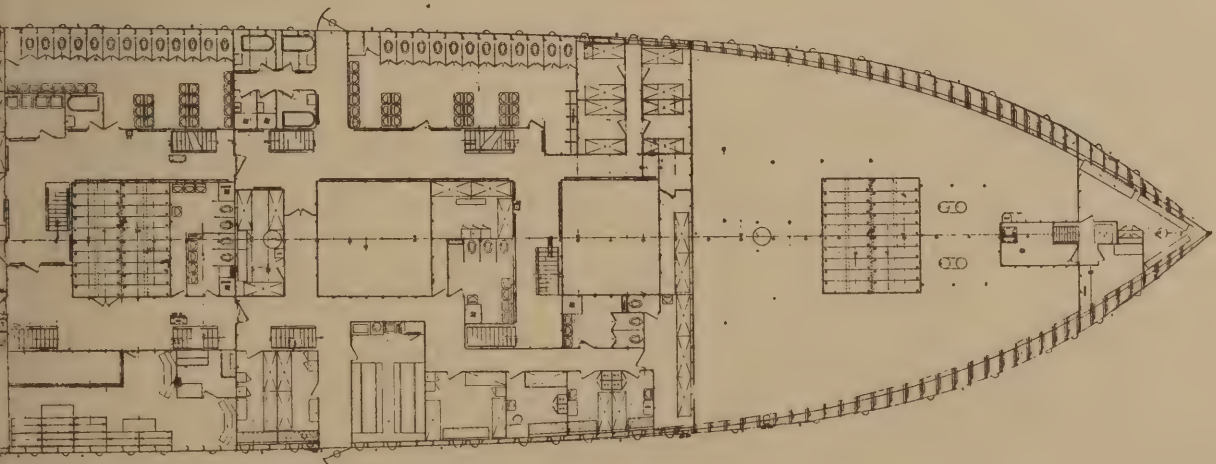
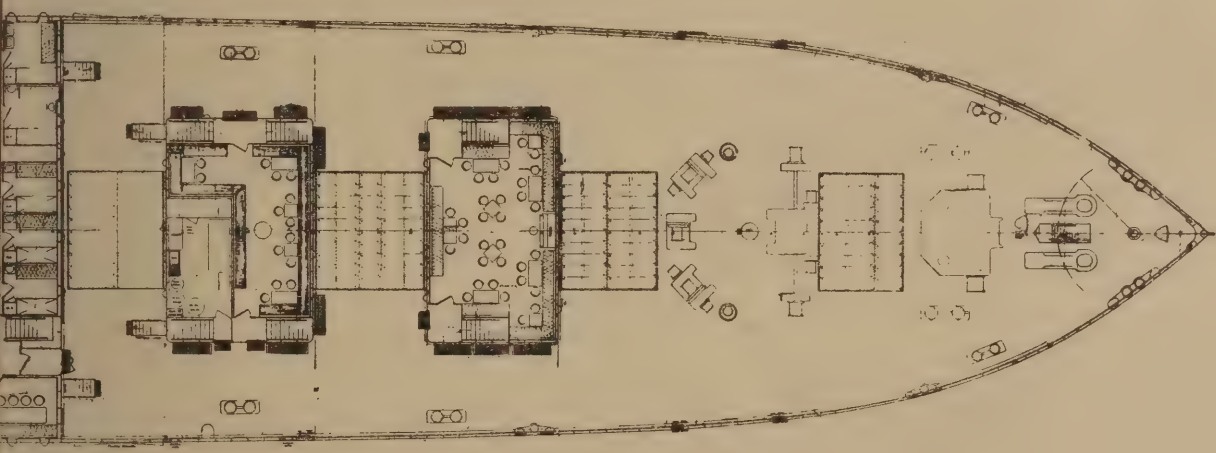
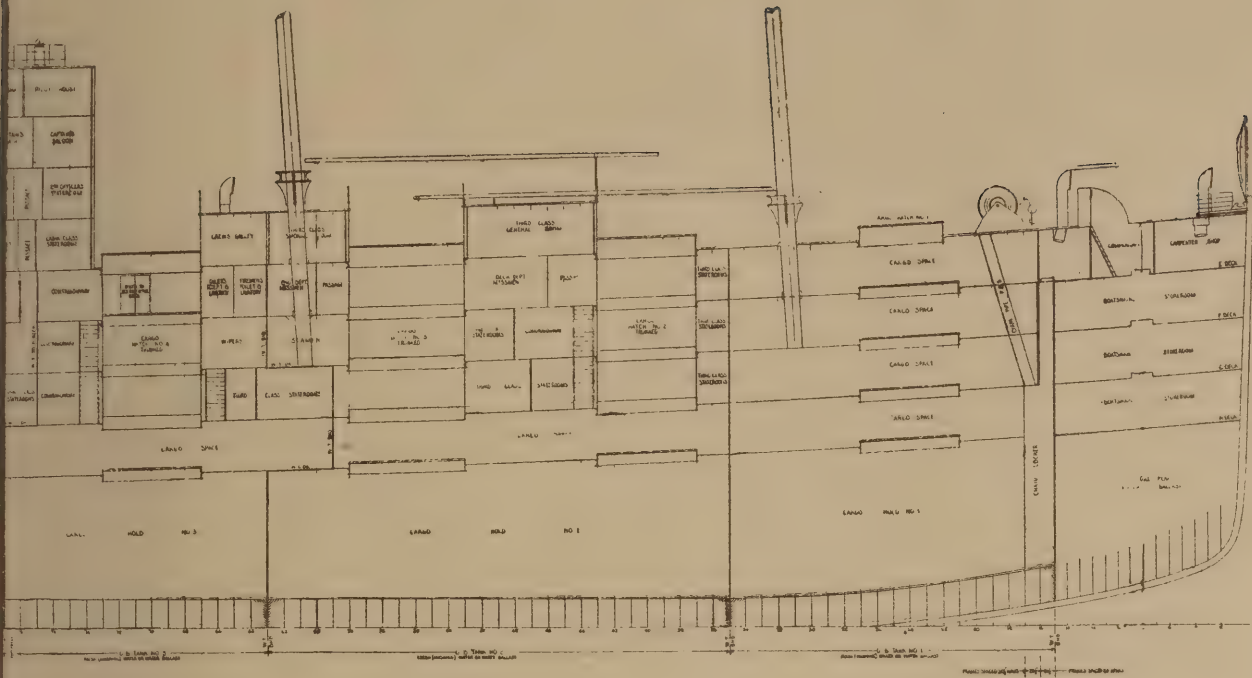
In general all passenger, officer and crew accommodations and the passenger hospital spaces, with the exception of lavatory and toilet spaces, will be laid with Lit-O-Sil-O flooring; where practicable, however, the existing Lit-O-Sil-O flooring shall be retained and such portions as are damaged will be removed and replaced. The existing wood decking in the original second class dining room will be removed and replaced with Lit-O-Sil-O.

Lavatory and toilet spaces, baths and laundries, crew's hospitals, isolation hospitals and operating room will be laid with vitreous tile, galley and pantry spaces will be laid with quarry tile. The staterooms will be laid with carpets, and rugs will be furnished for the social hall, the writing room and ladies' saloon. A portion of the social hall will be laid with maple flooring for dancing.

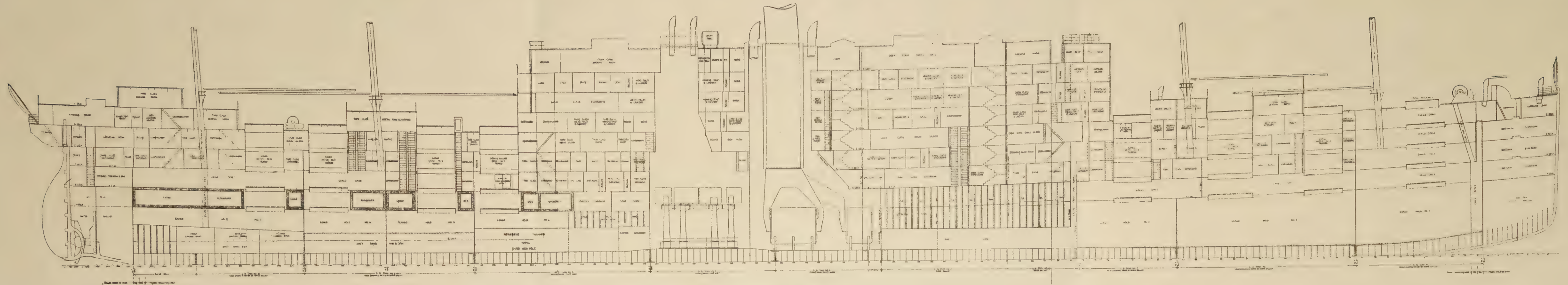
ARTIFICIAL VENTILATION AND HEATING SYSTEMS

The entire existing artificial and natural ventilation systems in the passenger, officer and crew accommodations, including supply and exhaust fans and their ducts, will be removed and new systems installed. Electrically-driven supply and exhaust fans will be installed in connection with

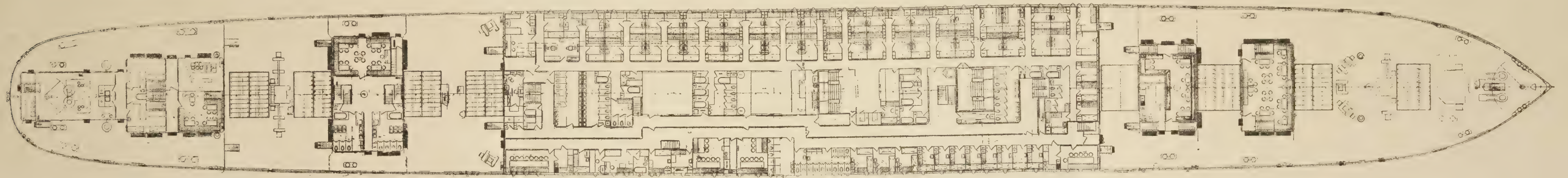
UCHANAN



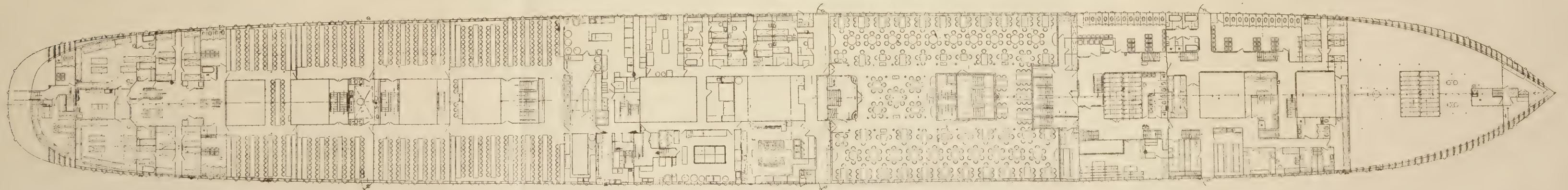
THE RECONDITIONING OF THE STEAMSHIP PRESIDENT BUCHANAN



INBOARD PROFILE



D DECK



E DECK

General Arrangement Plans of Passenger Steamship President Buchanan: Inboard Profile and Plans of D and E Decks

these new systems in conjunction with thermotanks for the heated air supply systems. The air supply to inside rooms in cabin passengers' staterooms on *B*, *C* and *D* decks and to all cabin passengers' staterooms on *F* and *G* decks and to all officers' and crew's staterooms, berthing spaces and messrooms below *D* deck, galley and pantry spaces below *D* deck will not be artificially heated. The air supply to the cabin class social hall, writing and ladies' saloon, smoking and dining room and to all third class staterooms and dining room, hospital spaces, etc., will be artificially heated. Artificial air exhaust systems will be installed from all toilet and lavatory spaces and bathrooms except from the third class lavatory and toilet spaces in the house on *D* deck aft and from all galley and pantry spaces except the galley in the deck house on *D* deck forward.

CARGO HOLD VENTILATION

Existing natural supply and exhaust ventilators to compartments will be retained but those that are not found in serviceable condition will be replaced. However, cargo spaces now assigned to other purposes will have their ventilators removed and new systems installed.

STEAM HEATING SYSTEM

The existing steam heating system will be removed and a new one with cast iron wall type radiators and copper pipe sill heaters will be installed in the passengers', officers' and crew's accommodations.

STEAM COOKING AND WATER HEATING SYSTEM

The existing steam cooking and water heating system will be removed and a new system installed. This will consist of a steam supply for cooking and water heating in galley, bakery, butcher shop, pantry and messrooms and the hot water heating system in the seamen's, oilers' and firemen's washroom and water heaters in the stewards' slop lockers, laundries, hospital spaces, etc., and a salt water heater which will supply all bathtubs and washers except those in the hospital.

PLUMBING

All existing plumbing fixtures, fittings and piping will be removed and new systems installed. Free standing cast iron enamel tubs supplied with hot and cold salt water will be fitted in all bathrooms with the exception of those in the hospital spaces which will receive a fresh water supply from local heaters. In the third class and crew's spaces nickel plated brass washer heads supplied with cold and hot salt water will be fitted. Practically all cabin passenger staterooms, public lavatory spaces, officers' and petty officers' staterooms will be furnished with cast iron enamel lavatories supplied with cold fresh water and fitted with drains. Similar lavatories will be fitted in the hospital spaces and supplied with fresh hot and cold water.

FRESH AND SALT WATER PIPING SYSTEM

The whole of the existing fresh and salt water piping system will be removed and new systems installed. Features of the new systems will be cold fresh water for washing purposes which will be led to all lavatories in cabin passenger staterooms except those in *G* deck and to cabin and third class public lavatory spaces and to officers' staterooms and to such places as galley and pantry spaces, messrooms, operating room, etc.

Another feature will be running ice water which will be supplied to the cabin and third class pantries, service pantries, officers' and crew's messrooms and to drinking fountains in all third class passenger berthing spaces and to engine and boiler rooms. This ice water system will be operated as follows: New pumps located in the engine room will take

water from the drinking water tanks and force it through two filters and a riser to a brine cooled scuttle butt located under the engine hatch from where it will be distributed by means of a circulating piping system.

FIRE DETECTING AND EXTINGUISHING SYSTEM

Fire detection as well as extinguishing apparatus will be installed to cover all cargo spaces and will be on the Rich system. The whole of the existing fire alarm system will be removed and a new manual operated fire alarm system installed in the cabin and third class passengers' and officers' accommodations, crew's spaces, engine and fireroom and refrigeration spaces. This will be supplemented further with an automatic fire alarm system covering all spaces and compartments.

POWER AND LIGHTING DISTRIBUTION

A complete new system for the distribution of electric power and lighting current will be installed in all parts of the vessel and will include portable lighting fixtures in the cargo spaces. This will necessitate the removal of the whole of the existing power and lighting distribution system.

INTERIOR COMMUNICATION SYSTEM

All of the existing interior communication system, including wiring, fixtures and telephones will be removed and the following new systems installed complete, viz., cabin passengers' annunciator system, cabin smoking room annunciator system, deck officers' annunciator system, engineering officers' annunciator system, stewards' annunciator system, cabin, pantry and galley call bell system, watertight door communicating system, refrigerator door communicating system and siren control system, life buoy release, loud speaking telephone system, inter-telephone (5 station) system, mechanical talking and steering telephone system (reconditioned) helm angle communicating system, wiring for submarine signal system, voice tubes and gyro compass installation.

LIFEBOATS

The vessel will be equipped with new lifeboats and handling gear capable of accommodating 2,670 persons. Two motorboats and 42 lifeboats will be installed and they will be operated by mechanical davits.

CABIN CLASS JOINER WORK

In general each stateroom will have one permanent berth, one sofa berth and one or more Pullman type berths. Wardrobes will be built-in and of laminated hard wood with a mahogany finish. Two fold-up seats of hard wood secured to the bulkhead shall be provided for each stateroom except where there is not sufficient room, in which case two camp stools or one seat and one camp stool will be provided.

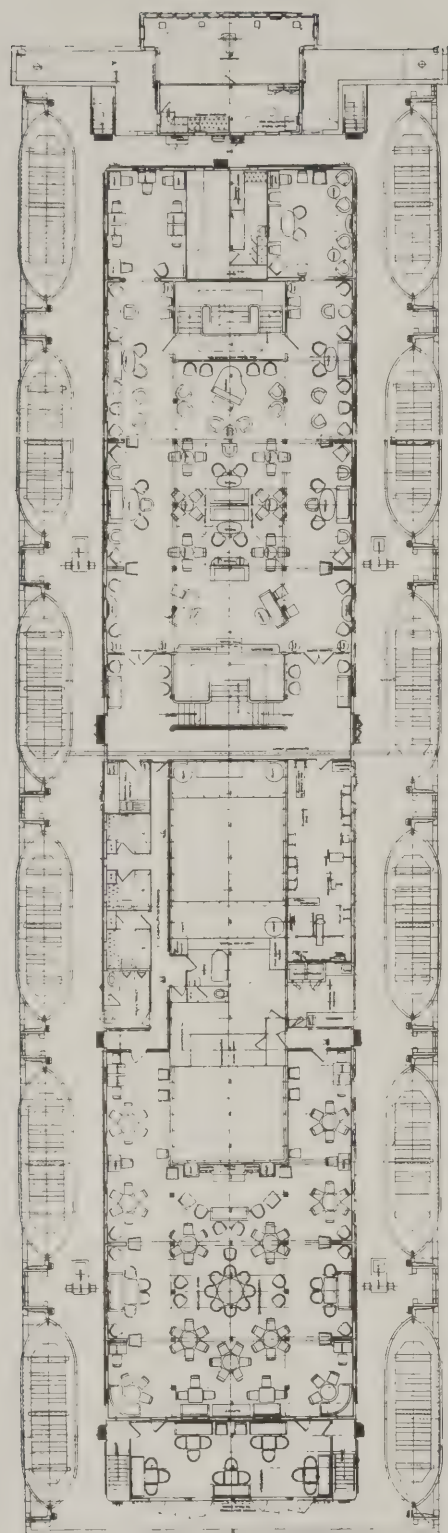
GYRO COMPASS

A gyro compass system of the Sperry merchant type and of the latest design will be installed. There will be one master gyro compass, one compass control panel, two alarm indicators, two motor generators, two dynamometers, two storage batteries, one set of dry cell batteries, one steering repeater with reading glass and cover for the wheelhouse, one steering repeater mounted in a waterproof stand at the aft docking bridge, one bulkhead type steering repeater in the captain's stateroom, one continuous course recorder for chart room and two bearing repeaters with pelorus stands for mounting on the bridge wings.

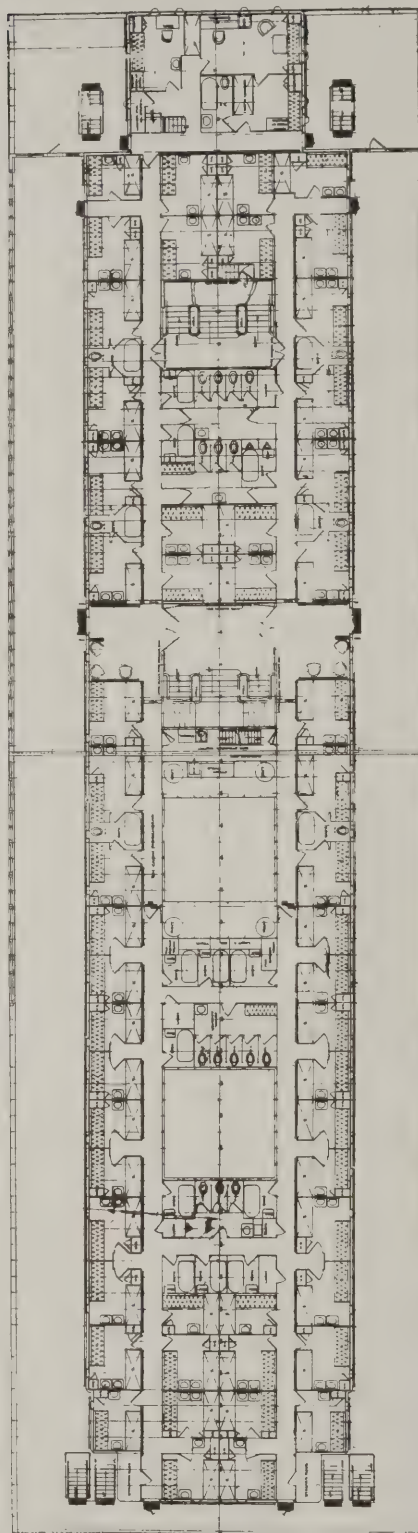
FUEL OIL SYSTEM

Many changes and additions to machinery and piping will be necessary to convert the vessel into an oil burner.

The filling stations will be between frames 119 and 122



General Arrangement of A Deck



General Arrangement of B Deck

on *E* deck and shall be carried through a 10-inch filling main and 8-inch transfer lines alongside of a new pipe tunnel to be constructed through deep tanks between frames 79 and 110. The inboard deep tanks between frames 101 and 110 will be used as settling tanks and will be connected to the fuel service system by high and low pump suction.

OIL FILLING CONNECTIONS

There will be 10-inch flange filling connections with strainer fitted in each filling station with 10-inch pipes led through *E* deck to a suitable height above *F* deck along through side of fidley and down to about 12 inches

for determining the height of oil in service in storage tanks will be fitted.

BOILER ROOM

In the boiler room a new single ended boiler equipped with Howden forced draft system will be installed. This boiler will be located on the port side of the centerline of the vessel abreast of an existing single ended boiler.

ELECTRIC GENERATORS

Three new electric generators are to be fitted each capable of developing 200 kilowatts at 1,000 revolutions per minute

below deck with 10-inch gates connecting pipes terminating in a tee near centerline. From this tee a 10-inch pipe will be led through fidley to connect with transfer lines as specified elsewhere. The 10-inch fuel oil filling line will lead to a point at centerline of ship and just aft of forward boiler room boiler, where it will terminate with a 10-inch gate valve. Below this valve there will be fitted a cross fitting with 5-inch branches to each settling tank. Eight-inch transfer lines will lead up each side of pipe tunnel with suitable manifold for filling and emptying individual tanks. These lines will be cross connected after last manifold with a gate valve and cross over pipe.

BALLAST SYSTEM

The ballast system is to be changed so as to provide means for filling or pumping out all double bottoms, fore and after peaks and deep tanks abreast the thrust recess used for carriage of washing water. The present cast iron and steel ballast line will be utilized wherever possible but any defective material is to be removed.

REFRIGERATING MACHINERY

Two 15-ton York CO₂ compressors driven by single vertical engines will be installed to replace present machinery which will be removed along with its evaporator. There will also be two CO₂ condensers fitted and each will be of sufficient capacity to accommodate one machine when operating at its maximum capacity.

TANK GAGING, SOUNDING AND SIGNALING SYSTEMS

The conversion of double bottoms to oil tanks will require the installation of sounding pipes in every tank and pneumaticators or some other method

They are to be driven by geared turbines operating at 5,000 revolutions per minute. Turbine and generator will be mounted on a common bedplate.

These turbines are to be capable of operating under a boiler pressure of 215 pounds per square inch when exhausting against a back pressure of 15 pounds above atmosphere. With normal steam pressure of 200 pounds per square inch and a back pressure of 10 pounds per square inch at the stage the requirements for steam consumption for half and full loads will be as follows: At full capacity, 52 pounds and at half capacity, 62 pounds.

The deep tanks and settling tanks will have a capacity of about 3,130 tons of fuel oil. Fourteen tanks, including the two settling tanks, will be constructed forward of the boiler

room, extending from frame 79 to frame 111 and from top of double bottom to *G* deck. This will involve the construction of two new oiltight bulkheads and an oiltight pipe tunnel on the double bottom at the centerline.

MACHINERY ALTERATIONS

The main and auxiliary propelling machinery and boilers will be given a complete overhauling and the term "overhauling" means that every item in the engine department will be given a thorough examination and all defective parts will either be reconditioned or renewed. The main engines, which consist of two vertical inverted quadruple expansion engines, will be given very careful attention and placed in first class operating condition.

Propellers—II

Factors Which a Propeller Formula Should Contain— Application of Froude's Formula to Full Size Propellers

By Alfred J. C. Robertson*

IN the preceding article the writer has shown how propeller data such as are given in Taylor's paper on "Propeller Position" (MARINE ENGINEERING AND SHIPPING AGE, December, 1922) can be used for the calculation of wake and thrust deduction from trial trip results and also how such data may be utilized for design purposes. Unfortunately, however, there is still very little of such propeller data available and it will therefore be interesting to see whether formulae such as Froude has used for his propellers will be of assistance to us.

But before trying to express the work of a propeller mathematically it will be necessary to refer to the various elements of a propeller as regards their effect upon the absorption or giving out of work.

PITCH RATIO

By far the most important element is the pitch ratio, the ratio of pitch to diameter. Assuming fixed diameter and revolutions, and speed of advance, there is always a pitch ratio at which the propeller does no work. A propeller of less than this pitch would tend to reduce the speed of advance, i. e. would absorb thrust instead of giving it out. As the pitch is increased the slip ratio increases and thrust also increases with a somewhat lesser increase of torque until maximum efficiency is reached and thereafter the rate of increase of torque is somewhat greater than that of thrust representing a continuous increase of horsepower but a decrease of efficiency.

The slip at no thrust is usually termed the effective slip and the corresponding pitch is equal to the speed of advance in feet divided by revolutions. This effective pitch is nearly always greater than the face pitch of the screw.

In Taylor's propeller No. 570 there is a condition of no thrust at—.07 percent slip, i. e. face pitch is 93 percent of effective pitch. For propeller No. 569 the effective slip is

$$\frac{1}{.91} \text{ of face slip, and for No. 571 the ratio is } \frac{1}{.88}.$$

It is evident therefore that the thrust developed is dependent upon the effective pitch ratio in conjunction with the effective slip ratio, and highest efficiency is reached at

about 21 percent effective slip for a pitch ratio of 1.5 and about 26 percent for a pitch ratio of .8 the slip for highest efficiency increasing with decrease of pitch.

BLADE AREA

The next propeller element of importance is the blade area, either developed or projected, and with area we must consider its distribution in two, three or four blades; and the shape of the blades, whether elliptical or wide tip. We must also consider the size of the propeller boss which naturally affects the shape and area of the propeller blades.

For comparative purposes it is necessary to express blade area by a ratio of the diameter, as mean width, or of $0.785 \times \text{diameter squared}$ as a ratio of the propeller disk.

It should be noted that area is important in the development of thrust, but that thrust does not increase nearly as fast as increase in propeller area, and efficiency generally decreases as the area ratio increases.

The same principle apparently applies in reference to the number of blades, but to a less extent—there is a small sacrifice in smooth water efficiency by increasing the number of blades in excess of two, but the difference is small and is generally more than offset by the more even torque, and there is a distinct advantage as regards stress conditions in the material of the blade, where three or four blades are used instead of two.

PROPELLER BOSS EFFECT

The propeller boss effect has never been accurately measured but as it affects the stream line motion through the propeller disk as well as the shape and center of effort of the propeller blade it is necessary to take some account of it. In general, Taylor's propeller bosses have a diameter of 20 percent of the propeller diameter and, if this rule is adhered to, comparative bossing effects will be eliminated.

Regarding the outline of the blade, many claims have been made for particular shapes, but no shape has been proved more efficient than a true ellipse and this shape is probably as strong as any so that there is no reason to depart from it.

The remaining propeller element having any important bearing on its thrust or efficiency is the blade thickness.

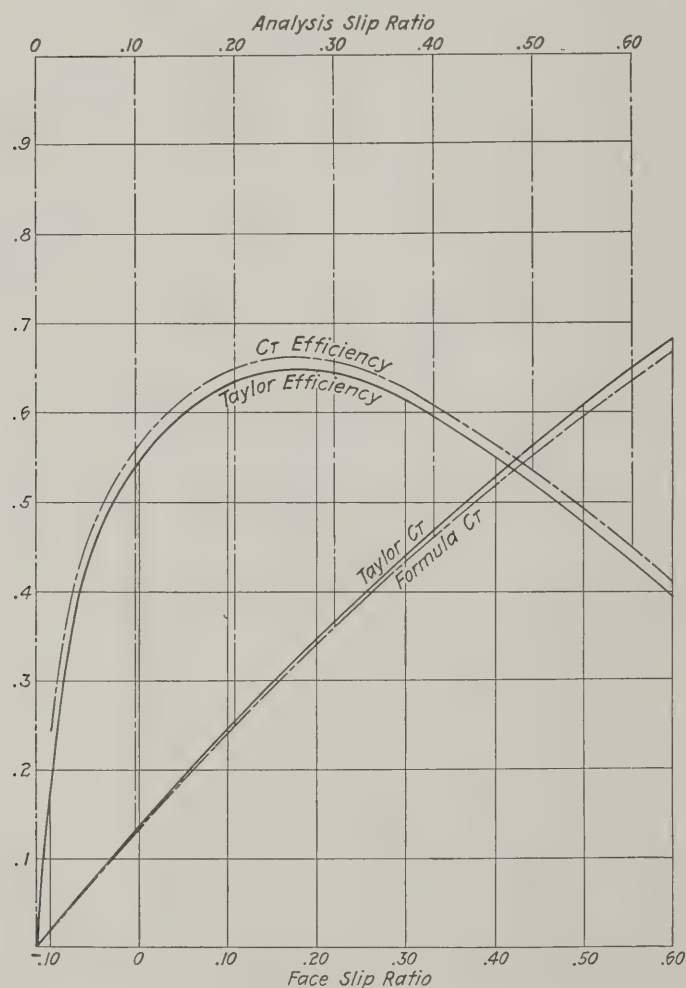
*Naval architect, Munson Steamship Line, New York.

This is best expressed for comparative purposes as the axial thickness.

The blade face and back are usually straight lines extending from the propeller centerline to its circumference at somewhat different angles and meeting at the blade tip. The distance on the fore and aft centerline of the propeller which separates these two lines is termed the axial thickness and is expressed as a ratio of the diameter. This axial thickness is a necessary evil, but may be reduced as the mean width of the propeller is increased and in Mr. Taylor's data this is done. Mr. Froude adhered to the same axial thickness throughout his experiments.

PROPELLER FORMULÆ

Any propeller formula should therefore contain, in addition to diameter, revolutions and speed of advance, factors



Taylor's Propeller No. 571

expressing the blade area and shape, the pitch ratio and the slip ratio.

Froude's propeller formula is:

$$\text{Thrust Horsepower} = Va^3 \times D^2 \times B \times \frac{(p+21)}{p} \times \frac{S}{310.9} \times \frac{(1-.08S)}{(1-S)^2}$$

where Va is speed of advance of propeller in knots, D is diameter in feet, B is a blade factor depending on the number of blades, their area and their shape, p is analysis pitch ratio, and S is analysis slip ratio. It will be noticed that the above formula does not include any adjustment of power due to variation of boss diameter or axial thickness. The former is partially covered by disk area ratio on which B values are plotted and the axial thickness is important

chiefly as it affects true (analysis) pitch, but there is room for further study along both these lines.

For application to full size propellers, Froude concluded that analysis pitch should be assumed as two percent higher than face pitch, and this is the particular feature of Froude's data which causes doubt and confusion.

In examining a number of propeller data curves, the writer has concluded that the slip correction factor $(1 - .08S)$ could well be modified to $(1 - S/3)$ and with this correction C_T may be written:

$$C_T = \frac{B}{2.723} \times \frac{p+21}{p} \times S(1-S/3) \times \left(\frac{\text{Analysis Pitch}}{\text{Face Pitch}} \right)^2$$

$$\text{and } T.H.P. = \frac{C_T \times R^2 P^2 D^2 V}{117.24}$$

where R = Revolutions in hundreds.

P = Face pitch in feet.

D = Diameter in feet.

the constants 2.723 and 117.24 being simply dimension correction factors.

A curve of C_T is shown herewith plotted by formula, together with Taylor's experimental C_T for propeller No. 571, and it will be noted that the C_T curves would coincide if "B" value were taken at .1084 instead of .1066. Such a difference would easily be accounted for if corrections for diameter of boss and axial thickness were included in the formula*.

A very convenient way of plotting propeller data is a modification of Taylor's ρ^{δ} diagram suggested by a study of Froude's formulæ.

$$\text{On a base of Taylor's } \rho = \text{Revs.} \sqrt{\frac{Q.H.P.}{Va^5}}$$

or, more conveniently for use where the effective horsepower

$$\text{is known from tank tests, on Revs.} \sqrt{\frac{T.H.P.}{Va^5}} \text{ curves of } \frac{D \times R}{Va}$$

may be plotted for each pitch ratio, with corresponding efficiency and slip ratio curves, so that it is possible by inspection at once to select the best diameter for any particular problem and its corresponding pitch ratio; and the slip ratio may also be read off, this factor being necessary for the analysis of trial results.

Where the effective or analysis pitch is unknown, face pitch can be used as Taylor has done. It is, however, interesting to note that curves of C_Q and C_T may be plotted by formula on face slip ratio, the formula of course having adjusted blade coefficients and including the addition of C_Q and C_T values at zero slip ratio, these quantities being expressed by a formula which includes the various blade elements.

There is quite a discrepancy as a rule between the results of a ship on the measured mile and the results reported in the ship's log and until the discrepancies between these two sources of data are satisfactorily explained it is difficult to make any material advance in our knowledge of propeller performances.

There is no doubt that the average weather at sea adds to the resistance of a ship over that experienced in smooth waters on the measured mile, but there is also no doubt that the I. H. P. reported at sea, or even the S. H. P. by the torsion meter, give far from satisfactory results and can hardly be relied upon within five percent, even when carried out with care. But, in many cases the engineers, seeking to get all the credit they may in fuel economy, will take indicator readings at the maximum power in a day's run. This gives us a low figure for the fuel consumption but gives us

(Continued on page 239)

*Froude's boss diameter was 9 percent of diameter; Taylor's is 20 percent. Froude's axial thickness was 3 percent of diameter; Taylor's is 4 percent.

Recent Motorship Building In Europe

**Large Number of New Motorships and Motor Liners
Now Under Construction and in Contemplation**

By Our Special London Correspondent

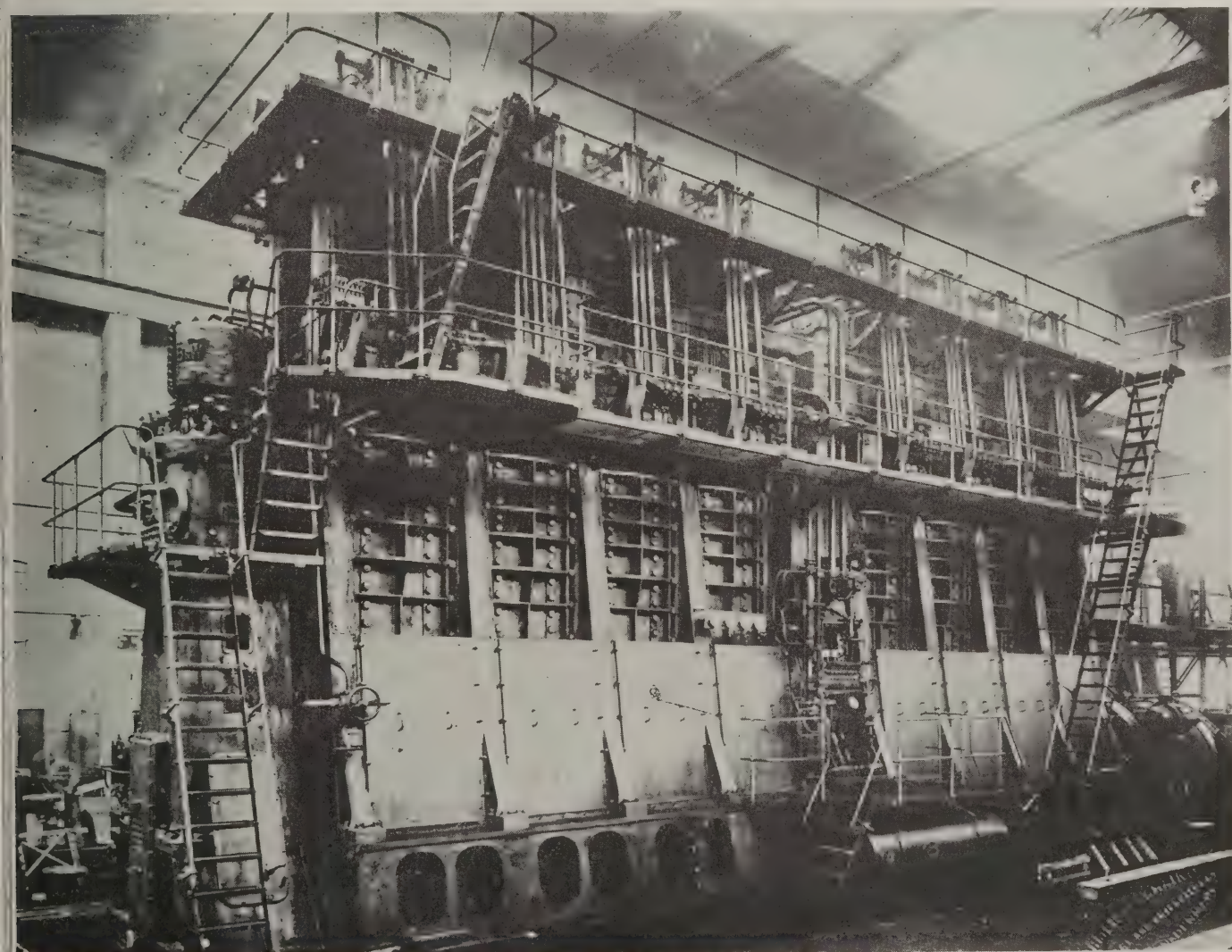
PARTLY because of the increasing confidence which is now felt in the marine internal combustion engine, and partly because of the shipowner's undoubted preference for single screw motorships, there is now a marked tendency in Europe to build vessels of this class. Orders have recently been placed for nine or 10 motorships totaling about 60,000 tons deadweight, the installation in each case comprising a single Doxford opposed piston engine of 2,000 or 3,000 brake horsepower. The Holt Line is having a 10,000-ton vessel constructed in which will be fitted a 3,000 brake horsepower six-cylinder Camellaird Fullagar engine, running at 85 revolutions per minute, this being the largest of its type yet produced, while Messrs. Fearnley and Eger of Christiania, have ordered two 7,500-ton single screw ships, each equipped with a 2,600 brake horsepower motor.

In single screw vessels, relatively low speed of rotation is, of course, essential for high propeller efficiency and all of the engines used for the purpose are of what is termed the long-stroke design with a high stroke-bore ratio, the speed

varying between about 75 and 85 revolutions per minute. It might be thought that in this connection, the two stroke type would show to special advantage, particularly in the higher powers. This is undoubtedly the case, but builders of the four-cycle Diesel engine have tackled the problem energetically, with the result that long-stroke, slow-speed motors of this design, are now being constructed in powers up to 3,000 indicated horsepower.

NEW BURMEISTER AND WAIN ENGINE

The first example of such an engine has just been completed by Burmeister and Wain, and is now being installed in an 8,000-ton cargo vessel, under construction at Palmers' Yard on the Tyne, for the Ocean Steamship Company, of Liverpool. Its full output of 3,000 indicated horsepower is developed at 85 revolutions per minute and as will be seen from the illustration, it is an eight-cylinder type with a single three-stage air compressor. This is a point of some interest since in the 3,000 indicated horsepower Burmeister



The First 3,000 Indicated Horsepower Burmeister and Wain Long Stroke Engine for a Single Screw Ship

and Wain engine used in twin screw ships (running at 115 revolutions per minute), two air compressors in tandem have invariably been provided. Equally noteworthy is the fact that in the ship in question, there is to be no electrically driven auxiliary compressor for the supply of air for starting and maneuvering purposes. It is considered that the surplus air from the compressor on the propelling engine and the individual three-stage compressors on the Diesel engines driving the electric generators, will be sufficient for all purposes.

The engine has cylinders 29.13 inches in diameter and a 59.06-inch stroke, the bore being the same as that of the short stroke engine of the same power, while the stroke is 13.78

the starting platform and by means of a system of levers and a lay shaft, the lift of all the fuel valve spindles is regulated at the same time. On the test bed it was found that in this way the speed of the engine could easily be controlled down to about 20 revolutions per minute. So far as the method of valve operation and reversing are concerned, no alteration has been made from normal practice. The first of these engines built by Harland and Wolff has been installed in a 6,500-ton vessel built in Spain for the Sota y Aznar Company, while the second is for a 7,800-ton cargo ship for Messrs. MacIver and Company, Liverpool.

A 15,000-TON MOTOR LINER

If as is generally believed, the type of passenger liner most commonly built in the future is one not exceeding 20,000 tons displacement, it is probable that a majority of these vessels will be equipped with internal combustion engines since motors are now available, suitable for the propulsion of such craft. In addition to the 22,000-ton, 18-knot passenger liner for the Union Steamship Company of New Zealand, which the Fairfield Company is now building on the Clyde, an order has just been placed for a vessel of 15,000 tons by the Rotterdam Lloyd Steamship Company for service between Rotterdam and the Dutch East Indies. Two further contracts are likely to be fixed in the future, one for a transatlantic liner for the Scandinavian American Line in which machinery of about 15,000 brake horsepower is to be fitted, and the other a liner for the United Steamship Company with twin screw machinery of 14,000 brake horsepower. In this latter ship it is stated that two double acting four-cycle engines of a new type will be installed.

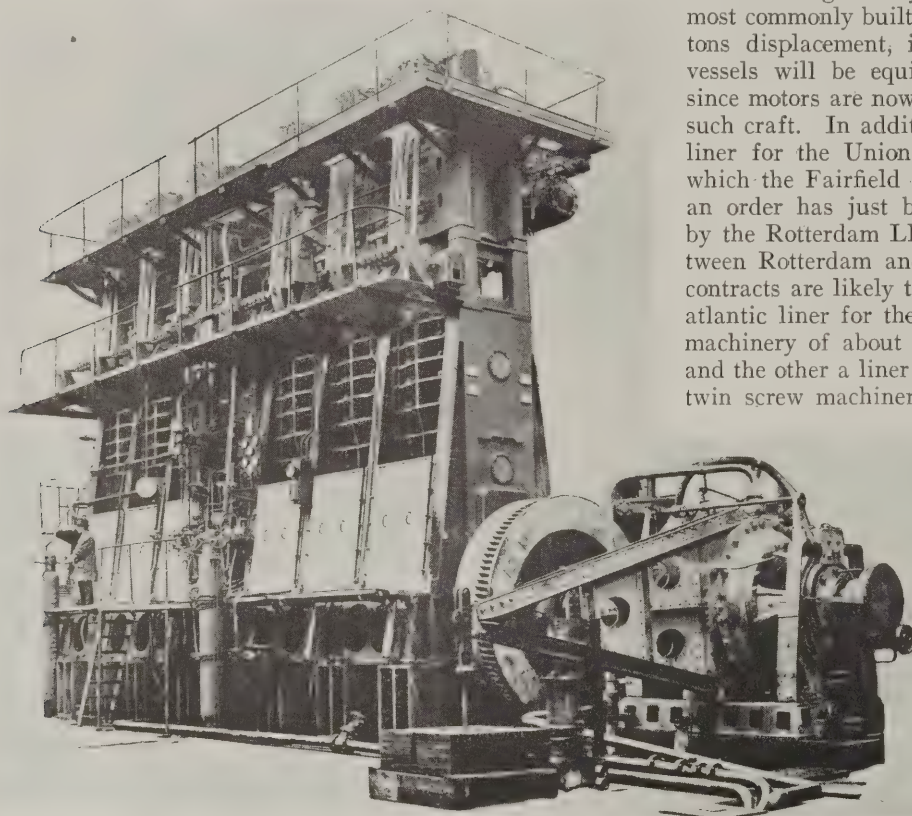
LARGEST INSTALLATION YET CONSTRUCTED

The new liner for the Rotterdam Lloyd Steamship Company, which is being built at the De Schelde Shipbuilding & Engineering Company's yard at Flushing, will be 500 feet long and will have a draft of 27 feet. The propelling machinery will comprise two Sulzer two-cycle engines each of 3,500 brake horsepower with six cylinders, and the notably low speed of 85 revolutions per minute

will be adopted. The two motors will be the largest that have yet been constructed for installation in a ship, and it is a matter of interest that they are to be built under license by the Dutch firm which has not hitherto engaged upon the manufacture of marine Diesel engines.

TURBO BLOWERS WILL SUPPLY SCAVENGING AIR

The motors will be of the standard Sulzer type with auxiliary port scavenging and the new system of providing scavenging air by means of separately driven turbo blowers will be utilized, instead of having piston scavenging pumps driven off the engine crankshaft. There will probably be three of these blowers, each driven by a direct current motor of about 200 brake horsepower and two sets will be in operation when the vessel is at sea. This will naturally involve very large electric generating equipment, and Diesel engines totalling 1,500 brake horsepower will be fitted, driving the generators. The liner will carry about 400 passengers at a speed of 15 knots, in addition to a certain amount of cargo. All the auxiliary plant will be electrically operated, including winches, steering gear and engine room pumps. It is understood that the new ship will be completed about the same time as the liner for the Union Steamship Company, namely, towards the end of the summer of 1924.



1,800 Brake Horsepower Long Stroke Diesel Engine Built by Harland and Wolff

inches greater. There is, however, little difference in the piston speed, which in this motor, is about 820 feet per minute. This is a figure which experience has shown, may well be exceeded and the builders are already prepared to construct eight-cylinder engines on the same principle developing 4,000 indicated horsepower. Incidentally it may be stated that the mechanical efficiency is in the neighborhood of 80 percent and the shaft horsepower developed by the engine illustrated is slightly under 2,400.

NO VARIATION IN GENERAL DESIGN

There is no variation in the general design of the long-stroke engine in comparison with the normal type, apart from the minor modification in construction necessitated by the long-stroke, and the adoption of a single, instead of two compressors. Harland and Wolff, the British licensees of Burmeister and Wain, have just completed two engines of the same type but with six cylinders, the output in this case being 1,800 brake horsepower at 85 revolutions per minute. In order to obtain increased flexibility of operation, an arrangement has been devised whereby at low speed, the lift of each of the fuel valves in the six cylinders may be diminished.

This operation is carried out by turning a handwheel at

Dyson's Method Applied to Merchant Ship Propellers*

By E. A. Stevens, Jr.

During the transactions of this society in 1920, Admiral C. W. Dyson presented a paper entitled "The Problem of the Hull and Its Screw Propeller," in which a number of examples were shown. These were all navy vessels with the exception of the first problem. It has been claimed by many that, while this method is very accurate for these vessels, especially those fitted with twin screws, the block coefficients of which do not exceed 0.65, it might not be applicable to merchant ships with full lines and fitted with one propeller. The writer presents in this article several ships of this type, together with other types of merchant ships, and shows the results of Dyson's analysis, together with the results obtained on the trial trips.

AN argument used against Dyson's method is that while the anticipated power and revolutions obtained by the calculation compare favorably with those developed on the trial trip, the same cannot be said regarding the power and revolutions per minute obtained at sea. This, however true it may be, is not due to the method but to the way it is used. In the latter case, an addition of 20 to 30 percent should be made to the effective horsepower of the ship as found from the model test.

Before attacking any of the problems it might be well to mention one thing. The basic slip (S) is dependent not only on the corrected block coefficient but also on the ratio of twice the length of after body divided by the draft. In a few cases coming to the writer's attention, it was impossible to obtain the length of after body. In order to make a reasonable estimate of this length, about forty-five ships were plotted with block coefficients as abscissas and length of after body divided by length between perpendiculars as ordinates. These varied considerably, but a fair average would be as shown in the following table:

L. A. B.		L. A. B.	
B. C.	L. B. P.	B. C.	L. B. P.
0.60	0.50	0.725	0.407
0.625	0.494	0.750	0.376
0.65	0.48	0.775	0.339
0.675	0.46	0.80	0.302
0.700	0.436	0.825	0.265

If the ship is fitted with a cruiser stern, the length of waterline should be used in place of length between perpendiculars.

If the above table is used for obtaining the length of after body, quite accurate results will be obtained as, in the majority of cases, it requires a material change in the basic slip to appreciably affect the revolutions.

The various problems may be divided into three groups: (1) Single-screw vessels; (2) vessels fitted with two or more screws, the wing screws being carried in struts; (3) vessels fitted with two or more screws, the wing screws being carried in bosses or spectacle frames.

GROUP 1

Problem 1.—The ship used in this problem is the S. S. *Gulfprince*, the trials of which were described by Mr. H. A. Everett in his paper entitled "Power and Speed Trials of Ten Thousand Deadweight-Ton Tanker," which was published in last year's volume of the transactions of this society. It will be noticed that the actual power is less than that calculated at the higher speeds, while at the lower speeds the reverse is the case. As the after body is quite long, the value of K is probably less than that shown on the chart, while the increase in actual power of the lower speeds in relation to that calculated is undoubtedly due to the falling off of the mechanical efficiency of the engine at the lower powers.

*Paper read before the Society of Naval Architects and Marine Engineers, New York, November 8, 1922.

Problem 2.—As this model had never been tested in the tank, no effective horsepower curves were available. The revolutions estimated (by using the indicated horsepower developed on the trial) compare favorably with those obtained on the trial. Calculations were then made for the effective horsepower which also compare favorably with an estimated effective horsepower obtained by using Taylor's

PROBLEM NO. 1

Hull		Propeller	
L = L.W.L. or L.B.P.	= 419.25	No. of Propellers	= 1
B = Beam	= 56.25	No. of Blades	= 4
H = Draft	= 25.562	Diam. = D	= 18
Δ = Displacement fresh water	= 13,390	Pitch = P	= 15.5
Nominal Block Coeff.	= .801	PA $\div$ DA	= .35
M. S. Coeff.	= .98	$\frac{3}{4} \times$ PA $\div$ DA	= .2625
H $\div$ B	= .455	T.S.	= 6,150
Type	= 2	P $\times$ R	= 1,685
B $\div$ L	= .134	I — S	= .86
B.C. on line C-D	= .688	V	= 14.3
H		I.Ta.	= 2.97
B.C. on line C-D corrected for $\frac{H}{B}$	= .75	I.H.P.	= 6,425
Slip BC line Z	= .845	P.C.	= .652
LAB	= 146.7	E.H.P.	= 1,490
2 LAB $\div$ H	= 11.5	S.H.P.	=
S = Basic Slip	= .14		
K.B.C.	= .804		
K	= 1.28		
v	= 11.5	11	10.5
e.h.p.	= 1,523	1,315	1,130
e.h.p. $\div$ E.H.P.	= .364	.314	.27
10 ^{2p}	= 2.87	3.34	3.92
IHPa	= 2,865	2,460	2,100
Actual IHPa	= 2,724	2,392	2,090
v $\div$ V	= .805	.77	.735
10 ^{2s}	= 1.54	1.76	2.00
s	= .096	.094	.092
Ra	= 83.3	79.4	75.6
Actual Ra	= 79.7	76.3	73

PROBLEM NO. 2

Hull		Propeller	
L = L.W.L. or L.B.P.	= 385	No. of Propellers	= 1
B = Beam	= 51	No. of Blades	= 4
H = Draft	= 26	Diam. = D	= 17.5
Δ = Displacement	= 11,590	Pitch = P	= 19
Nominal Block Coeff.	= .793	PA $\div$ DA	= .36
M.S. Coeff.	= .989	$\frac{3}{4} \times$ PA $\div$ DA	= .27
H $\div$ B	= .51	T.S.	= 6,290
Type	= 2	P $\times$ R	= 2,170
B $\div$ L	= .1325	I — S	= .86
B.C. on line C-D	= .676	V	= 18.4
H		I.Ta.	= 3.12
B.C. on line C-D corrected for $\frac{H}{B}$	= .805	I.H.P.	= 8,220
Slip BC line Z	= .882	P.C.	= .646
LAB	= 145	E.H.P.	= 5,310
2 LAB $\div$ H	= 11.15	S.H.P.	=
S = Basic Slip	= .14		
K.B.C.	= .795		
K	= 1.255		
v	= 11.192		
I.H.P. on trial	= 2,695		
v $\div$ V	= .608		
10 ^{2s}	= 3.412		
s	= .152		
Ra	= 70.4		
Ra on trial	= 69.75		
e.h.p. $\div$ E.H.P.	= .302		
10 ^{2p}	= 3.48		
10 ^{2p} =			
$\frac{IHP \times 10^{2p}}{IHPa}$			3.257
10 ^{2p} = 10 ^{2p} $\times$ K			4.07
e.h.p. $\div$ E.H.P.			.26
$\frac{e.h.p.}{E.H.P.}$			1,380
Estimated e.h.p.			1,385

PROBLEM No. 3

Hull		Propeller	
L = L.W.L. or L.B.P.	= 390	No. of Propellers...	= 1
B = Beam	= 54	No. of Blades	= 4
H = Draft	= 24.5	Diam. = D	= 17
Δ = Displacement	= 11,450	Pitch = P	= 14.03
Nominal Block Coeff.	= .776	PA $\div$ DA	= .374
M. S. Coeff.	= .996	$\frac{3}{4} \times$ PA $\div$ DA	= .27
H $\div$ B	= .454	T.S.	= 6,290
Type	= 2	P $\times$ R	= 1,650
B $\div$ L	= .1385	I — S	= .833
B.C. on line C-D	= .668	V	= 13.56
B.C. on line C-D corrected for $\frac{H}{B}$	= .73	I.Ta.	= 3.12
Slip BC line Z	= .833	I.H.P.	= 5,890
LAB	= 136	P.C.	= .637
2 LAB $\div$ H	= 11.1	E.H.P.	= 3,755
S = Basic Slip	= .167	S.H.P.	= 5,420
K.B.C.	= .79		
K	= 1.24		
v			11.38
e.h.p.			1,350
e.h.p. $\div$ E.H.P.			.36
10^{2p}			2.9
S.H.P. _d			2,320
S.H.P. _d Estimated			2,500
v $\div$ V			.84
10^{2s}			1.37
s			.098
Ra			89.3
Actual Ra			88.8

PROBLEM No. 4

Hull		Propeller	
L = L.W.L. or L.B.P.	= 410.16	No. of Propellers...	= 1
B = Beam	= 54	No. of Blades	= 4
H = Draft	= 23.5	Diam. = D	= 17.083
Δ = Displacement	= 11,989	Pitch = P	= 16.02
Nominal Block Coeff.	= .80	PA $\div$ DA	= .382
M. S. Coeff.	= .985	$\frac{3}{4} \times$ PA $\div$ DA	= .286
H $\div$ B	= .435	T.S.	= 6,540
Type	= 2	P $\times$ R	= 1,950
B $\div$ L	= .1315	I — S	= .792
B.C. on line C-D	= .682	V	= 15.25
B.C. on line C-D corrected for $\frac{H}{B}$	= .715	I.Ta.	= 3.44
Slip BC line Z	= .823	I.H.P.	= 7,760
LAB	= 123	P.C.	= .632
2 LAB $\div$ H	= 10.45	E.H.P.	= 4,900
S = Basic Slip	= .208	S.H.P.	
K.B.C.	= .80		
K	= 1.27		
v			11.16
e.h.p.			1,480
e.h.p. $\div$ E.H.P.			.302
10^{2p}			3.48
I.H.P. _d			2,830
Actual I.H.P. _d			2,774
v $\div$ V			.732
10^{2s}			2.02
s			.153
Ra			83.8
Actual Ra			83.1

method. The resistance per ton of displacement was taken from a ship of the following dimensions: Length between perpendiculars, 380; beam, 53; draft, 24; displacement, 10,900 tons; block coefficient, 0.79; midship section coefficient, 0.988.

Problem 3.—This ship was fitted with geared turbines. Unfortunately, no torsion meter was installed, but the shaft horsepower was estimated from curves supplied by the manufacturer of the turbine. The vessel was first run on a twelve-hour trial, during which the following were the average pressures and temperatures:

Pressure at throttle	186 pounds gage
Pressure at nozzles	182 pounds gage
Superheat	Not given
Temperature at exhaust	96.3 degrees F.
Vacuum corresponding to 96.3 degrees F.	28.3
Shaft horsepower from curves	2,500

Progressive runs were then made over the Provincetown course with the following results:

Speed in knots	Revolutions per minute
6.355	50.075
8.055	64.05
9.511	74.00
11.447	89.37

From this the speed on the twelve-hour run was estimated to be 11.38 knots.

It will be noticed that while the revolutions per minute on the trial practically agree with the analysis, there is quite some difference in the horsepower. This might be explained

PROBLEM No. 5

Hull		Propeller	
L = L.W.L. or L.B.P.	= 331	No. of Propellers...	= 1
B = Beam	= 47	No. of Blades	= 4
H = Draft	= 16.92	Diam. = D	= 14.5
Δ = Displacement	= 4,875	Pitch = P	= 14.5
Nominal Block Coeff.	= .65	PA $\div$ DA	= .40
M. S. Coeff.	= .954	$\frac{3}{4} \times$ PA $\div$ DA	= .30
H $\div$ B	= .36	T.S.	= 6,766
Type	= 2	P $\times$ R	= 2,150
B $\div$ L	= .142	I — S	= .947
B.C. on line C-D	= .565	V	= 20.3
B.C. on line C-D corrected for $\frac{H}{B}$	= .49	I.Ta.	= 3.73
Slip BC line Z	= .65	I.H.P.	= 6,680
LAB	= 142.75	P.C.	= .63
2 LAB $\div$ H	= 16.85	E.H.P.	= 415
S = Basic Slip	= .053	S.H.P.	
K.B.C.	= .712		
K	= 1.102		
v	12.792	12.233	11.246
e.h.p.	1,110	935	730
e.h.p. $\div$ E.H.P.	.258	.225	.176
10^{2p}	4.10	4.72	6.07
I.H.P. _d	1,800	1,560	1,215
Actual I.H.P. _d	1,750	1,604	1,123
v $\div$ V	.63	.604	.555
10^{2s}	3.13	3.535	4.49
s	.045	.044	.043
Ra	93.6	89.4	82.0
Actual Ra	95.38	92.85	82.97

PROBLEM No. 6

Hull		Propeller	
L = L.W.L. or L.B.P.	= 410.46	No. of Propellers...	= 1
B = Beam	= 54	No. of Blades	= 4
H = Draft	= 24.167	Diam. = D	= 17.00
Δ = Displacement	= 12,250	Pitch = P	= 15.75
Nominal Block Coeff.	= .80	PA $\div$ DA	= .342
M. S. Coeff.	= .982	$\frac{3}{4} \times$ PA $\div$ DA	= .2565
H $\div$ B	= .447	T.S.	= 6,070
Type	= 2	P $\times$ R	= 1,790
B $\div$ L	= .1314	I — S	= .785
B.C. on line C-D	= .677	V	= 13.87
B.C. on line C-D corrected for $\frac{H}{B}$	= .73	I.Ta.	= 2.86
Slip BC line Z	= .833	I.H.P.	= 5,860
LAB	= 123	P.C.	= .6575
2 LAB $\div$ H	= 10.2	E.H.P.	= 3,850
S = Basic Slip	= .215	S.H.P.	
K.B.C.	= .796		
K	= 1.26		
v		9.385	8.952
Actual I.H.P. _d		2,088	1,700
v $\div$ V		.676	.645
10^{2s}		2.56	2.92
s		.196	.182
Ra		75.0	70.5
Actual Ra		74.57	70.38
e.h.p. ₁ $\div$ E.H.P.		.318	.27
10^{2s}		3.30	3.92
$10^{2p} = \sqrt{\frac{I.H.P. \times 10^{41}}{I.H.P._d}}$		3.04	3.675
$10^{2p} = 10^{2p} \times K$		3.83	4.63
e.h.p. $\div$ E.H.P.		.2755	.229
e.h.p. = E.H.P. $\times$ (e.h.p. $\div$ E.H.P.)		1,060	882
e.h.p. Model 1013		898	787

PROBLEM No. 7

Hull		Propeller	
L = L.W.L. or L.B.P.	= 415	No. of Propellers...	= 1
B = Beam	= 56	No. of Blades	= 4
H = Draft	= 25.5	Diam. = D	= 17.75
Δ = Displacement	= 13,573	Pitch = P	= 17.5
Nominal Block Coeff.	= .806	PA $\div$ DA	= .375
M. S. Coeff.	= .973	$\frac{3}{4} \times$ PA $\div$ DA	= .281
H $\div$ B	= .455	T.S.	= 6,450
Type	= 2	P $\times$ R	= 2,0.5
B $\div$ L	= .135	I — S	= .87
B.C. on line C-D	= .694	V	= 17.4
B.C. on line C-D corrected for $\frac{H}{B}$	= .76	I.Ta.	= 3.32
Slip BC line Z	= .853	I.H.P.	= 8,400
LAB	= 148	P.C.	= .6.7
2 LAB $\div$ H	= 11.6	E.H.P.	= 5,350
S = Basic Slip	= .13	S.H.P.	
K.B.C.	= .808		
K	= 1.29		
v	11.322	10.934	11.375
v $\div$ V	.652	.629	.654
10^{2s}	2.832	3.144	2.804
Actual I.H.P. _d	2,706	2,601	2,756
s	.119	.127	.120
Ra	74.4	72.5	74.6
Actual Ra	75.2	72.46	74.2
$10^{2p} = \frac{I.H.P. \times K}{I.H.P._d}$	4.00	4.16	3.935
e.h.p. $\div$ E.H.P.	.264	.2545	.2685
e.h.p. = E.H.P. $\times$ (e.h.p. $\div$ E.H.P.)	1,423	1,362	1,437
Estimated e.h.p.	1,450	1,280	1,480

by the fact that, the propeller being a cast iron wheel, the roughness of its surface added at least 2 to 3 percent to the power, while the remainder may be due to a slight inaccu-

PROBLEM No. 8

Hull		Propeller	
L = L.W.L. or L.B.P.	= 520	No. of Propellers ..	= 2
B = Beam	= 65.23	No. of Blades ..	= 3
H = Draft	= 27.75	Diam. = D	= 15.954
A = Displacement	= 19,452	Pitch = P	= 14.422
Nominal Block Coeff	= .725	PA ÷ DA	= .304
M.S. Coeff	= .984	T.S.	= 6,850
H ÷ B	= .425	P × R	= 1,972
Type	= 2	I — S	= .805
B ÷ L	= .125	V	= 15.67
B.C. on line C-D	= .593	I.T.d	= 3.8
		IHP	= 13,100
B.C. on line C-D corrected for	= .60	P.C.	= .678
		E.H.P.	= 8,870
		S.H.P.	= 12,050
Slip BC line X	= .625		
LAB Estimated	= 183		
LAB ÷ H	= 13.2		
S = Basic Slip	= .195		
K.B.C.	= .618		
K	= 1.2		
		14.99	14.00
		4,420	3,550
		.498	.40
		2.06	2.59
		7,030	5,580
		7,150	5,460
		.957	.894
		1.0	1.134
		.114	.102
		118.8	109.5
		116.72	108.5

PROBLEM No. 9

Hull		Propeller	
L = L.W.L. or L.B.P.	= 528	No. of Propellers ..	= 2
B = Beam	= 62.23	No. of Blades ..	= 3
H = Draft	= 27.35	Diam. = D	= 16.5
A = Displacement	= 18,700	Pitch = P	= .18
Nominal Block Coeff	= .726	PA ÷ DA	= .278
M.S. Coeff	= .984	T.S.	= 6,410
H ÷ B	= .42	P × R	= 2,225
Type	= 2	I — S	= .82
B ÷ L	= .118	V	= 18.0
B.C. on line C-D	= .579	I.T.d	= 3.29
B.C. on line C-D corrected for	= .61	I.H.P.	= 13,680
		P.C.	= .691
Slip BC line X	= .635	E.H.P.	= 9,450
LAB	= 184	S.H.P.	=
LAB ÷ H	= 13.45		
S = Basic Slip	= .18		
K.B.C.	= .605		
K	= 1.188		
		15.5	
		5,130	
		.543	
		1.886	
		8,620	
		8,400	
		.862	
		1.278	
		.145	
		102	
		98.2	

PROBLEM No. 10

Hull		Propeller	
L = L.W.L. or L.B.P.	= 522	No. of Propellers ..	= 2
B = Beam	= 62	No. of Blades ..	= 3
H = Draft	= 19.4	Diam. = D	= 16.5
A = Displacement	= 12,000	Pitch = P	= 16.167
Nominal Block Coeff	= .671	PA ÷ DA	= .30
M.S. Coeff	= .992	T.S.	= 6,766
H ÷ B	= .313	P × R	= 1,107
Type	= 2	I — S	= .834
B ÷ L	= .119	V	= 17.33
B.C. on line C-D	= .533	I.T.d	= 3.73
B.C. on line C-D corrected for	= .42	I.H.P.	= 14,680
		P.C.	= .68
Slip BC line X	= .455	E.H.P.	= 10,000
LAB	= 208	S.H.P.	=
LAB ÷ H	= 21.5		
S = Basic Slip	= .166		
K.B.C.	= .562		
K	= 1.145		
		14.79	
		3,700	
		.37	
		2.82	
		5,960	
		6,540	
		.854	
		1,305	
		.088	
		101.8	
		104.75	

acy of the gages and thermometer or a difference between the superheat obtained on this trial and that for which the curves were drawn.

Problem 4.—As there was no measured mile within reasonable distance, the run was made from Ambrose Light Ship to Fire Island Light Ship and return. The revolutions were held as near constant as was possible, and indi-

cator cards were taken every fifteen minutes. While the results are not as accurate as if the run had been made over a measured mile, it is believed they are sufficiently accurate to warrant presenting them in this paper. There was a very slight swell and a breeze of not over 3 knots during the trial.

Problem 5.—The data for this problem were taken from "Notes on the Performance of S. S. Tyler," by Mr. E. H. Rigg, published in Vol. XX of the transactions of this society. The data given as actual indicated horsepower and R_d are those observed on the trial runs. If those of the faired curves had been given, the actual indicated horsepower for 12.233 knots would have been 1,480 and the actual R_d would have been 90.8 and for 9.876 knots the actual indicated horsepower and R_d would have been 790 and 73.2.

Problem 6.—The power and revolutions as given by an analysis did not agree with those obtained on the trial. As the difference was so great, an investigation was made as to the causes. It was found that the wheel was working in cavitation and the effective horsepowers were greater than those shown on the curves. An analysis was made for revolutions (using the indicated horsepower from the trials), which check with those obtained on the runs. The effective horsepowers were then calculated and compared with those of Model 1013, the block and midship section coefficient and dimensions of which are the same as this ship. The length of after body was the same, while the middle body of Model 1013 was slightly less and the fore body slightly longer. The forward sections of the ship were more of the U shape, and the after sections had more of a club foot than the model. According to experiments conducted by Professors H. C. Sadler and E. M. Bragg, the results of which were published in last year's transactions, it would appear that Model 1013 would require slightly less power for these low speeds. This would only partly account for the difference; the remainder would probably be caused by the condition of the ship's bottom. The vessel was drydocked and then loaded, after which the trial was run. The time between drydocking and the trial was about three weeks.

Problem 7.—The results of the trials at two speeds of three ships of the same design, together with the analysis, are given in this problem. No effective horsepower curves were available. The revolutions were calculated using the indicated horsepower. The effective horsepower was then calculated and compared with that estimated.

GROUP 2

We will now pass to the second group; namely, ships fitted with more than one screw, the shafts of the wing propellers being carried in struts. The first two, Problems 8 and 9, are the navy colliers *Jupiter* and *Cyclops*. While these are not merchant ships, their forms are very similar to moderate speed freighters or to slow speed passenger and cargo ships and are included in this paper for lack of other available data.

Problem 8.—As the writer was not in possession of the length of after body of this ship, an estimate was made using that of the *Cyclops* (Problem 9).

Problem 10.—This ship had been in the water for some time before the trial, which accounts for the difference in horsepower between the estimate and that obtained on the trial. Unfortunately indicator cards were not taken on the mile run, but were taken after the same. The average power was 6,155 and average revolutions 102.75. Assuming the power to vary as the cube of the revolutions we have

$$6,155 \times \left(\frac{104.75}{102.75} \right)^3 = 6,540, \text{ which is used as the indi-}$$

cated horsepower on the mile course. If this figure (6,540) was used in the calculations for slip in place of the estimated power, R_d would have been 102.8 in place of 101.8.

PROBLEM No. 11 (A)

Hull		Propeller	
L = L.W.L. or L.B.P.	= 530	No. of Propellers...	= 2
B = Beam	= 72	No. of Blades...	= 3
H = Draft	= 24	Diam. = D.	= 17.00
Δ = Displacement	= 16,013	Pitch = P.	= 18.50
Nominal Block Coeff.	= .612	PA $\div$ DA	= .315
M. S. Coeff.	= .982	T.S.	= 7,020
H $\div$ B	= .334	P $\times$ R.	= 2,430
Type	= 2	I - S.	= .86
B $\div$ L	= .136	V	= 20.60
B.C. on line C-D	= .526		
B.C. on line C-D corrected for	= .451	I.Ta.	= 4.02
Slip BC line X	= .485	I.H.P.	= 19,350
LAB	= 250	P.C.	= .673
2 LAB $\div$ H	= 21.2	E.H.P.	= 13,020
S = Basic Slip	= .14	S.H.P.	= 17,810
K.B.C.	= .552		
K	= 1.12		
v	20	18	16
e.h.p.	9,875	7,950	6,700
e.h.p. $\div$ E.H.P.	.758	.611	.515
10 ^{2p}	1.335	1.67	1.994
SHPa	14,950	11,950	10,000
Actual SHPa	14,950	11,900	9,855
v $\div$ V	.971	.922	.874
10 ^{2s}	1.0	1.04	1.214
s	.118	.098	.095
Ra	122.7	115.4	109
Actual Ra	122	115	109

PROBLEM No. 11 (B)

Hull		Propeller	
L = L.W.L. or L.B.P.	= 535	No. of Propellers...	= 2
B = Beam	= 72	No. of Blades...	= 3
H = Draft	= 30	Diam. = D.	= 17.0
Δ = Displacement	= 20,800	Pitch = P.	= 18.5
Nominal Block Coeff.	= .63	PA $\div$ DA	= .315
M. S. Coeff.	= .987	T.S.	= 7,020
H $\div$ B	= .417	P $\times$ R.	= 2,430
Type	= 2	I - S.	= .855
B $\div$ L	= .1345	V	= 20.52
B.C. on line C-D	= .534		
B.C. on line C-D corrected for	= .528	I.Ta.	= 4.02
Slip BC line X	= .558	I.H.P.	= 19,350
LAB	= 255	P.C.	= .673
2 LAB $\div$ H	= 17	E.H.P.	= 13,020
S = Basic Slip	= .145	S.H.P.	= 17,810
K.B.C.	= .563		
K	= 1.14		
v	19	18	16
e.h.p.	9,475	8,000	5,600
e.h.p. $\div$ E.H.P.	.728	.615	.43
10 ^{2p}	1.393	1.659	2.405
SHPa	14,500	12,250	8,450
Actual SHPa	14,500	12,100	8,400
v $\div$ V	.926	.8775	.78
10 ^{2s}	1.029	1.2	1.69
s	.122	.12	.116
Ra	112.7	112.2	99.2
Actual Ra	119.5	113	99.5

PROBLEM No. 11 (C)

Hull		Propeller	
L = L.W.L. or L.B.P.	= 535	No. of Propellers...	= 2
B = Beam	= 72	No. of Blades...	= 3
H = Draft	= 36	Diam. = D.	= 17
Δ = Displacement	= 25,863	Pitch = P.	= 18.5
Nominal Block Coeff.	= .652	PA $\div$ DA	= .315
M. S. Coeff.	= .989	T.S.	= 7,020
H $\div$ B	= .5	P $\times$ R.	= 2,430
Type	= 2	I - S.	= .867
B $\div$ L	= .1345	V	= 20.8
B.C. on line C-D	= .553		
B.C. on line C-D corrected for	= .645	I.Ta.	= 4.02
Slip BC line X	= .667	I.H.P.	= 19,350
LAB	= 255	P.C.	= .673
2 LAB $\div$ H	= 14.17	E.H.P.	= 13,020
S = Basic Slip	= .133	S.H.P.	= 17,810
K.B.C.	= .576		
K	= 1.16		
v	19	18	16
e.h.p.	11,200	9,350	6,375
e.h.p. $\div$ E.H.P.	.86	.718	.49
10 ^{2p}	1.17	1.413	2.098
SHPa	17,670	14,620	9,860
Actual SHPa	17,650	14,700	10,050
v $\div$ V	.913	.865	.769
10 ^{2s}	1.066	1.25	1.766
s	.141	.137	.121
Ra	121.2	114.3	100.8
Actual Ra	124	117	103

GROUP 3

When the wing shafts are carried in bosses, the basic slip seems to be affected if the bosses are horizontal or nearly so, as will be shown in Problem 12.

Problem 11.—Unfortunately, no trials were run on these ships at the designed deep draft of 30 feet. The model was

PROBLEM No. 11 (D)

Hull		Propeller	
L = L.W.L. or L.B.P.	= 530	No. of Propellers...	= 2
B = Beam	= 72	No. of Blades...	= 3
H = Draft	= 24	Diam. = D.	= 16.3
Δ = Displacement	= 16,013	Pitch = P.	= 17.0
Nominal Block Coeff.	= .612	PA $\div$ DA	= .323
M. S. Coeff.	= .983	T.S.	= 7,216
H $\div$ B	= .334	P $\times$ R.	= 2,363
Type	= 2	I - S.	= .86
B $\div$ L	= .136	V	= 20.05
B.C. on line C-D	= .526		
B.C. on line C-D corrected for	= .451	I.Ta.	= 4.25
Slip BC line X	= .485	I.H.P.	= 18,750
LAB	= 250	P.C.	= .667
2 LAB $\div$ H	= 21.2	E.H.P.	= 12,500
S = Basic Slip	= .14	S.H.P.	= 17,250
K.B.C.	= .552		
K	= 1.12		
v	19	18	16
e.h.p.	7,950	6,700	4,700
e.h.p. $\div$ E.H.P.	.636	.536	.25
10 ^{2p}	1.602	1.914	2.775
SHPa	12,050	10,080	6,960
Actual SHPa	13,400	11,370	7,820
v $\div$ V	.948	.898	.798
10 ^{2s}	1.0	1.121	1.588
s	.098	.092	.09
Ra	125.5	118	104.7
Actual Ra	126.4	119.7	105.7

PROBLEM No. 12

Hull		Propeller	
L = L.W.L. or L.B.P.	= 663	No. of Propellers...	= 2
B = Beam	= 67	No. of Blades...	= 4
H = Draft	= 29	Diam. = D.	= 22.32
Δ = Displacement	= 23,300	Pitch = P.	= 34.44
Nominal Block Coeff.	= .634	PA $\div$ DA	= .363
M. S. Coeff.	= .943	$\frac{3}{4}$ PA $\div$ DA	= .197
H $\div$ B	= .433	T.S.	= 5,161
Type	= 2	P $\times$ R.	= 2,535
B $\div$ L	= .101	I - S.	= .93
B.C. on line C-D	= .462	V	= 23.3
B.C. on line C-D corrected for	= .47	I.Ta.	= 1.8
Slip BC line... { Line X = .506 } { Line Y = .532 }	= .519	I.H.P.	= 18,800
LAB	= 331	P.C.	= .697
2 LAB $\div$ H	= 22.8	E.H.P.	= 13,100
S = Basic Slip	= .067	S.H.P.	= 25,300
K.B.C. { Line X = .496 } { Line Y = .526 }	= .511		
K	= 1.10		
v	23.5		
Actual IHP	36,000		
v $\div$ V	1.008		
10 ^{2s}	1.00		
s	.128		
Ra	79.8		
Actual Ra	79.5		
Estimated W.S. = 61,000 sq. ft.			
B $\div$ H = 2.31; Pris.			
Coeff. $\left(\frac{LWL}{100} \right)^3 = .672$			
$\Delta \div \left(\frac{LWL}{100} \right)^3 = 80;$			
10 ^{2p} = $\frac{IHP \times K}{IHPa}$ = 5.75			
e.h.p. $\div$ E.H.P. = 1.70			
e.h.p. = E.H.P. $\times \frac{e.h.p.}{E.H.P.}$ = 22,300			
Estimated e.h.p. = 24,057			
v $\div \sqrt{\frac{LWL}{61,000 \times 7,588 \times .009 \times .009}} = .912$			
E _s = .00307 $\times$.009 $\times$ 61,000 $\times$ 7,588 = 12,800			
E _r = .00307 $\times$ 23,300 $\times$ 5.4 $\times$ 23.5 = 9,070			
e.h.p. Bare Hull = 21,870			
e.h.p. with App. = 21,870 $\times$ 1.1 = 24,057			

Note—Draft on trial not known.

PROBLEM No. 13

Hull		Propeller	
L = L.W.L. or L.B.P.	= 439.5	No. of Propellers...	= 2
B = Beam	= 60	No. of Blades...	= 4
H = Draft	= 24	Diam. = D.	= 15.5
Δ = Displacement	= 14,250	Pitch = P.	= 11.75
Nominal Block Coeff.	= .787	PA $\div$ DA	= .357
M. S. Coeff.	= .987	$\frac{3}{4}$ PA $\div$ DA	= .168
H $\div$ B	= .40	T.S.	= 6,250
Type	= 2	P $\times$ R.	= 1,735
B $\div$ L	= .1365	I - S.	= .858
B.C. on line C-D	= .677	V	= 14.8
B.C. on line C-D corrected for	= .65	I.Ta.	= 3.08
Slip BC line { X = .67 } { Y = .698 }	= .684	I.H.P.	= 7,710
LAB	= 162.5	P.C.	= .648
2 LAB $\div$ H	= 13.55	E.H.P.	= 5,000
S = Basic Slip	= .142	S.H.P.	= 7,070
K.B.C. { Line X = .696 } { Line Y = .722 }	= .709		
K	= 1.37		

v	11.64
e.h.p. Estimated	1,695
e.h.p. $\div$ E.H.P.	.339
10 ^{2p}	3.09
SHPa	3,140
Estimated SHP = IHPa $\times$.75	3,160
v $\div$ V	.794
10 ^{2s}	1.61
Ra	113
Actual	109.92

PROBLEM NO. 14

Hull				Propeller				Wing		Centre	
L = L.W.L. or L.B.P.	=	500		No. of Propellers	=	2		2		1	
B = Beam	=	63		No. of Blades	=	3		3		3	
H = Draft	=	20.458		Diam. = D	=	9.167		9.167		9.167	
Δ = Displacement	=	9,612		Pitch = P	=	8.346		8.346		8.346	
Nominal Block Coeff.	=	.522		PA ÷ DA	=	.516		.516		.516	
M. S. Coeff. About	=	.935		T.S.	=	11,040		11,040		11,040	
H ÷ B	=	.325		P × R	=	3,200		3,200		3,200	
Type	=	3		I - S	=	.828		.828		.888	
B ÷ L	=	.126		V	=	26.2		26.2		28.1	
B.C. on line A-B	=	.388		I.Td.	=	9.23		9.23		9.23	
B.C. on line A-B corrected for $\frac{H}{B}$	=	.375		I.H.P. each	=	8,500		8,500		8,500	
Slip BC line. { X for Wing } { W for Centre }	=	.474		P.C.	=	.546		.546		.546	
LAB Estimated	=	200		E.H.P.	=	4,645		4,645		4,645	
2 LAB ÷ H	=	19.55		S.H.P.	=	7,810		7,810		7,810	
S = Basic Slip	=	.172									
K.B.C. { Line X for Wing } { Line W for Centre }	=	.485									
K	=	1.0									
V		23.99	23.194	21.088		18.839		16.541			
v ÷ V		.916	.855	.885		.825		.751		.631	
10 th		1.06	1.3	1.17		1.44		1.54		1.89	
Actual SHPa each		8,899	7,767	7,525		6,925		5,048		4,995	
s		.208	.145	.194		.143		.172		.135	
Rd		368	340	349		328.5		309.5		297	
Actual Ra		367	338.7	349.8		326.6		310.9		294.4	
SHP × K											
10 th = $\frac{SHP \times K}{SHPa}$		.878	1.125	1.039		1.263		1.548		1.735	
e.h.p. ÷ E.H.P.		1.133	.893	.964		.80		.657		.588	
e.h.p. for each screw		5,260	4,145	4,470		3,715		3,055		2,730	
Total e.h.p. = 2 wing + center		14,665	12,655	12,655		10,975		8,840		8,250	
e.h.p. Bare Hull		12,420	10,975	10,975		10,975		8,250		7,970	
Total e.h.p. ÷ e.h.p. B.H.		1.18	1.153	1.153		1.07		1.07		1.091	

tested at three drafts with model propellers. While the powers check very closely in all three cases, the estimated revolutions at 36-foot draft do not agree with those obtained from the model test. As this draft (36 feet) is four times the height of the center of propeller above the base line, this might be considered as a deep-draft vessel with propellers carried as deeply as possible, which condition is not covered in Admiral Dyson's latest work. A correction should be made for obtaining the basic slip. The writer is not prepared to say just how this should be made, but two ways are possible; first, taking the slip block coefficient and basic slip at a lighter draft, or second, by using a line on the block coefficient chart passing through the lower left-hand corner of the chart and cutting the right-hand side somewhere above line X. The slip block coefficient would then be less and the basic slip greater than what it would be by using line X.

A trial was run on a ship similar to this but fitted with different propellers. It will be noticed that, while the revolutions agree, there is some difference in the power. This was caused by the run being made on the Delaware Breakwater Course. The lack of deep water affects the power but does not seem to vary the revolutions for given speeds. This was shown by tests conducted by the United States Navy on the battleship *Michigan*, which was run over the Rock-land, Provincetown and Delaware Breakwater courses. While the revolutions for various speeds were practically the same on all the courses, the power varied considerably. As the draft and range of speed of the two ships are practically the same, it would be safe to consider that, had this ship been tested in deep water, the power developed would have been very close to that estimated, while the revolutions would be the same as those obtained on this trial.

The propeller shafts of both model and ship were carried in bosses set at about 32 degrees with the horizontal plane, the intersection of which with the hull was probably parallel or nearly parallel with the stream lines.

Problem 12.—The angle between the bosses and the horizontal plane on this ship was about 10 to 15 degrees which, as will be seen in the calculation, seems to affect the basic slip. The revolutions were first calculated using the value or slip block coefficient as given on line X, then using line Y.

In the former case the calculated revolutions were greater and in the latter they were less than those obtained on the trial. By using a value between these two, the calculated R_d worked out almost the same as the actual R_d . On account of lack of data, the value of K cannot be determined, but an estimate was made of the effective horsepower by the Taylor method and by calculation from the propeller data. There was quite some difference between these, which would be accounted for if the draft during the trial (which is not known) was less than 29 feet.

Problem 13.—For the same reason as mentioned in Problem 4, this ship was run from Ambrose Light Ship to Fire Island Light Ship and return. Unfortunately, the only effective horsepower curve available was for a draft of 28 feet 2 inches. Assuming the effective horsepower to vary as a means of the ratios of the displacements and the displacements to the two-third power, we have:

Displacement at 28 feet 2 inches	16,900
Displacement at 24 feet 0 inches	14,250
$(14,250 \div 16,900)^{2/3}$	0.894
$14,250 \div 16,900$	.844
Mean	.869
Effective horsepower (28-foot 2-inch draft) at 11.64 knots	= 1,860
Effective horsepower (24-foot draft) at 11.64 knots	= $1,860 \times 0.869 = 1,615$.

The above powers included the resistance of the rudder and bilge keels but not the propeller bosses, which is estimated at 80, making a total effective horsepower of 1,695. This vessel was fitted with Diesel engines, the mechanical efficiency of which was about 75 percent.

The angle of the bosses with the horizontal plane was about 20 degrees.

Problem 14.—This ship is the *Great Northern*, the trial-trip data of which were published in the *Journal of the American Society of Naval Engineers*. The values of effective horsepower, which were obtained by multiplying the shaft horsepower by the propulsive coefficients as shown on the trial curves, are probably that for the bare hull, as the propulsive coefficients are quite low and as the propellers are apparently out of cavitation. The revolutions were calculated using the shaft horsepower from the trial data, and compared with the actual revolutions. Calculations were

then made for the effective horsepower. The difference between the calculated effective horsepower and those obtained by multiplying the shaft horsepower by the propulsive coefficients could be taken as the power required for the appendages.

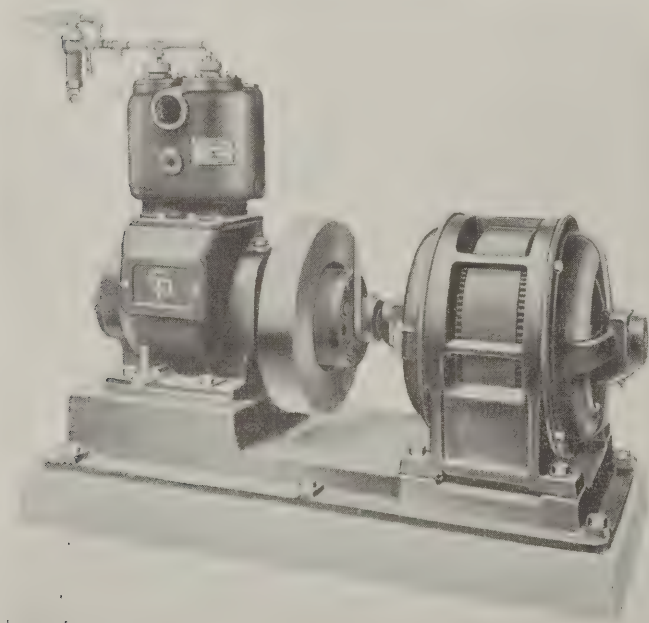
CONCLUSION

In the foregoing are represented almost every type of seagoing merchant ships. Problems 1 to 7 are single screw ships and, with the exception of Problem 5, have full lines, the block coefficients being over 0.77. Problem 13 is a full-bodied cargo ship with twin screws. Problems 8, 9 and 10 are of the slow cargo and passenger type or moderate speed freighter, fitted with twin screws. Problem 11 is a moderate speed cargo and passenger ship, while Problems 12 and 14 represent high speed passenger vessels. The vessel in Problem 5 was built for the coast trade between New York and Norfolk. When loaded to her deep draft (about 22 feet) her underwater body was similar to a moderate speed cargo and passenger vessel with single screw. At the draft at which the trial was run (16 feet 11 inches), the underwater body was more like a sound or river steamer with a full midship section.

The writer regrets that he had to include in this paper examples where either very accurate or full information was not obtainable, but was obliged to do so because of the lack of more complete data.

Flexible Couplings Make Direct Motor Drive Compressors Possible

BECAUSE of the demand for a small air compressor which could be directly connected to an electric motor, the Chicago Pneumatic Tool Company, Chicago, Ill., has recently developed a line of high speed compressors which can be directly connected to either electric motors or internal combustion engines by means of flexible couplings. The compressors are of the vertical, duplex, single acting, water-cooled type fitted with "Simplate" flat disk inlet and discharge valves. The straight and uniform lift of these valves affords a maximum effective valve area which makes possible the speed at which these compressors operate.



Small Air Compressor Directly Coupled to Electric Motor Through Flexible Coupling

The machines are built in three sizes having piston displacements of 128, 160 and 210 cubic feet of air per minute and are suitable for working pressures of 150 pounds per square inch. The standard speed of these sizes is 600 revolutions per minute.

The equipment includes a hand starter for the motor and an inlet valve unloader for the compressor. Where the demand for air is intermittent the motor can be furnished with an automatic starter which starts and stops the unit within pre-determined pressure limits. When this type of starter is used the compressor is equipped with a centrifugal unloader which automatically relieves the compressor of its load while the motor is starting up or shutting down. A water control valve is also furnished which is operated by air pressure governed by a centrifugal unloader. Since the lubrication is accomplished by a combination pump and splash system the entire unit is automatic as the electric current, air delivery, circulating water and lubrication are all accurately controlled automatically.

NEW ITALIAN LINER.—The Navigazione Generale Italiana announces that they have now in the course of construction a new passenger vessel, the *Duilio* which is to be a sister ship of the *Giulio Cesare*, of 21,500 tons.



(Photograph, Kadel & Herbert, N. Y.)

Uncle Sam's Lightships No Longer Out of Touch with the World

Uncle Sam has now equipped his lightships with the very latest and most modern radio equipment. The lightships can transmit and hold conversations with incoming ships to determine their positions at sea, also broadcasting fog and danger signals. The loneliness of the personnel of the lightships is now solved by the latest radio equipment which is installed under the direction of the Lighthouse Service in Washington which will enable the lightship keeper to tune in on concerts, lectures, etc. The above photograph shows the radio compass of the lightship at Ambrose Channel with first officer George H. Peterson seen tuning in. Note the receiving set on the right which consists of detector and six stages of audio frequency amplification.

The Current Actuated or Flettner Rudder*

Every rudder in a certain sense is current actuated since rudder pressure is only developed by a current. The new rudder described in this article also derives from the current the forces necessary for setting the rudder itself, constituting a fundamental departure from the time-honored arrangement of ships' rudders. The forces required for holding the rudder of a large ship against the current are very great, necessitating powerful steering engines to develop the turning moment necessary to rotate the rudder stock. By using the current actuated rudder the necessity for such great forces may be avoided and large ships may be steered by hand.

THE first practical application on a ship of the Flettner or current actuated rudder was made on the steamship *Frigido*, following several years of investigation with models and after a series of trials had been conducted upon a motorship. This experimental motorship was fitted with a current actuated rudder early in 1920 in order to test the practicability of the device, particularly in going astern. The scheme of using an auxiliary rudder at the after end of the main rudder for the purpose of developing side pressures for setting the main rudder was first applied in large German battle planes, several hundred of which were fitted with this appliance.

Before going into the details of the rudder, a few remarks are necessary to point out the elementary principles upon which the rudder depends.

PRINCIPLES AFFECTING RUDDER ACTION

Let us assume a ship in which a standpipe is fitted in connection with the water outside through a small pipe (Fig. 1).

With the ship in motion, the water in the standpipe sinks to a new level depending upon the velocity. This principle has been used in a well known type of speed measuring device.

As another example, Fig. 2 shows a canal in which the water is motionless. As soon as the water is put in motion, the

level in the standpipe (Fig. 3) drops. The height of water remaining in the tube (p) indicates the pressure existing in the stream at the orifice of the tube. The difference between the level in the tube and the level outside represents the loss in potential energy and the gain in kinetic energy in the moving liquid. This difference in level is a measure of

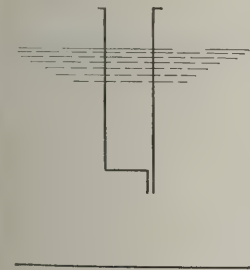


Fig. 1

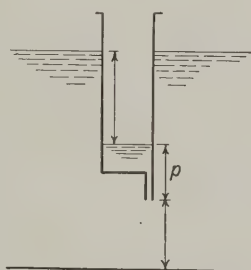


Fig. 2

Fig. 3

the kinetic energy in the liquid and where the velocity is v , the kinetic energy equals $\frac{v^2}{2g}$ (for metric units). If the loss in pressure is known, the velocity of the stream may be calculated.

If we explore the surfaces of a rudder which is set at an

angle to the current and plot the pressures we will obtain a diagram similar to Fig. 4, where we find upon the one side

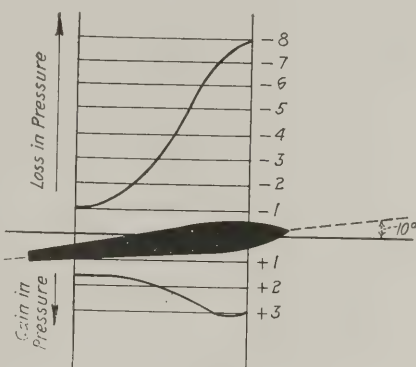


Fig. 4



Fig. 5

of the rudder a loss in pressure and upon the other side a gain in pressure. Furthermore, this loss or gain is not uniform over the length of the rudder but in general is greatest

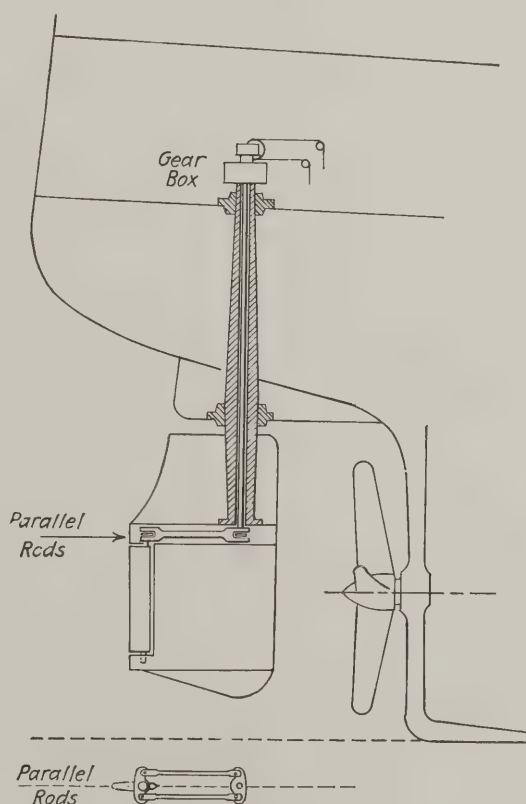


Fig. 6

near the leading edge. As a consequence of the unequal distribution of the pressure, the center of pressure is near the leading edge for small angles. For an angle of 90 degrees

*Abridged translation by Lieutenant E. L. Gayhart, C. C., U. S. N., of an article by Anton Flettner, Director of the Flettner Schiffsverf-Maatschappij Rotterdam-Berlin, appearing in *Werft-Reederei-Hafen* of August 22, 1922.

to the current the center of pressure moves to the center of the area, and for intermediate angles the motion is about as indicated in Fig. 5.

CURRENT ACTUATED RUDDER

The principle underlying the current actuated rudder is the development of a difference in pressure at the after edge of the rudder, which difference in pressure shall have a determined direction. Fig. 6 is a schematic representation of the new rudder arranged as an underhung rudder, while Fig. 7 represents the form as installed on the *Frigido*.

Figs. 8 and 9 represent diagrammatically the plan view of the rudder when going respectively ahead and astern. In

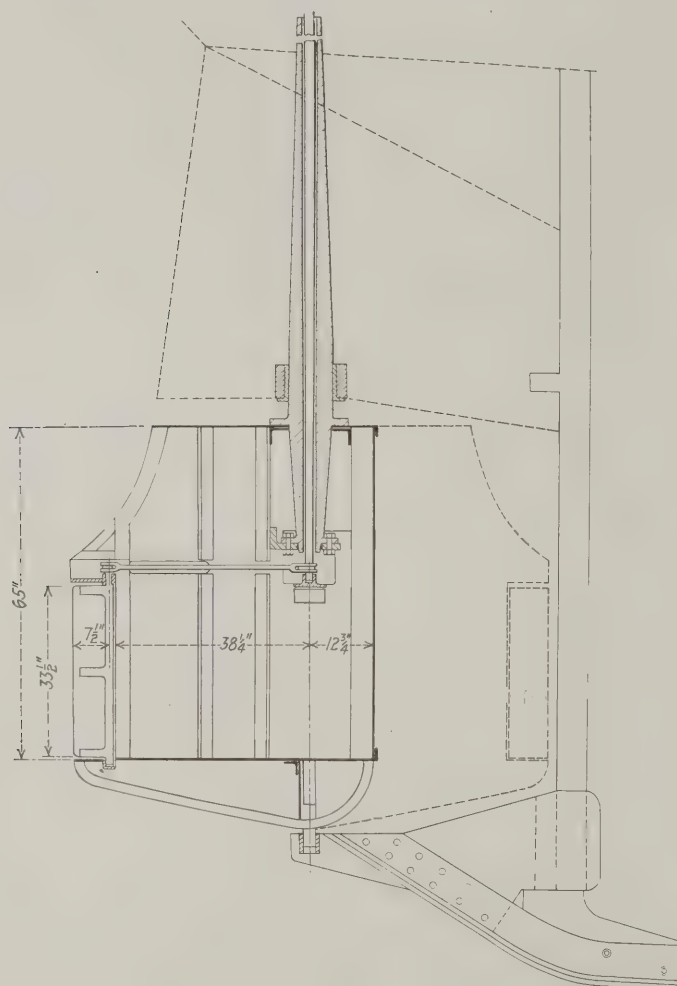


Fig. 7

these views, the positive and negative signs represent excess and diminished pressure and the number and distribution of these signs show the relative values of these pressures. When, as here shown, the auxiliary rudder is turned, a reduction in pressure occurs at the convex side of the angle in the vicinity of the auxiliary rudder with a feeble increase in pressure on the opposite side. If the auxiliary rudder had not been turned, the location of the center of pressure somewhat abaft the axis would have resulted in bringing the main rudder back to the midships position. But with the auxiliary rudder set as shown in the diagram, a certain pressure difference is developed at the after edge of the main rudder and the combined center of pressure of the system moves to the axis. The rudder then hangs in equilibrium as shown.

Mathematically, we might consider the system as a lever where the force P acting on the arm x is balanced by the force $P/20$ acting on an arm $20x$. This ratio of 1:20 is

assumed for example; actually, it may be made even more favorable by appropriate design.

Fig. 10 represents a ship with rudder of ordinary type at the moment of meeting the ship with the rudder when

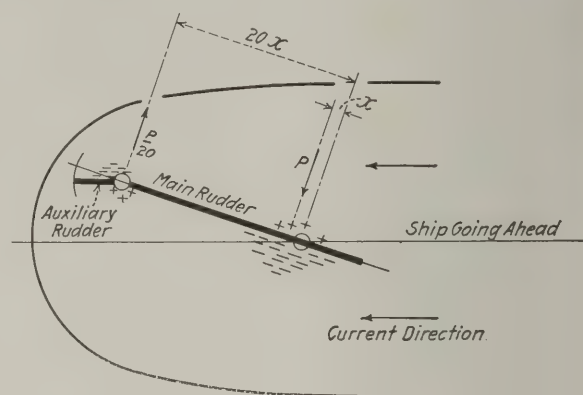


Fig. 8

straightening out from a turn. The current momentarily strikes the rudder at an angle of between 80 and 90 degrees. The center of pressure is near the middle of the rudder and, in consequence, the forces acting on the rudder are ex-

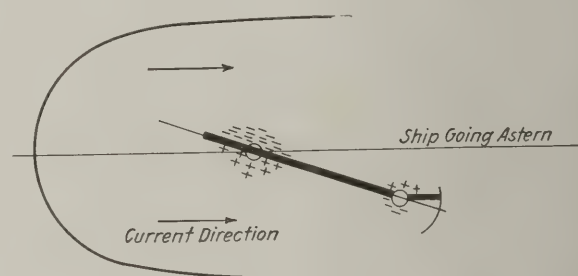


Fig. 9

cessive and the position of the rudder to the current is unfavorable for developing a turning effect on the ship.

The current actuated rudder can never be placed in such an unfavorable position relative to the current since it adjusts itself with respect to the effective direction of the current,



Fig. 10



Fig. 11

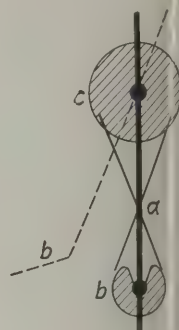


Fig. 12

which, in the situation just mentioned, does not correspond with the ship's head. When the helmsman puts his wheel hard over to check the ship's head, the current actuated rudder will not take that actual position but rather will hang momentarily near the fore and aft direction as indicated in Fig. 11. In this apparently unfavorable position the current strikes the rudder at a much better angle for developing turn-

ing effect on the ship than is the case with the normal rudder when put hard over too soon. Experience has demonstrated that the turning of the ship from one direction to another takes place with surprising rapidity.

CONTROL MECHANISM

The control mechanism for this rudder may be represented by the arrangement shown in Fig. 12. Here, *a* represents the main rudder, *b* the auxiliary rudder, and *c* a pulley capable of rotation about the axis of *a*. Suppose that *c* is turned through 15 degrees. Then the auxiliary rudder will be turned in such a direction that its effect on the main rudder will be to cause the latter to follow the motion of *c*. But as the main rudder swings to follow *c*, the auxiliary rudder is turned back toward the neutral position. This arrangement is but another example of the familiar follow-up gear. The main rudder, because of the restoring of the position of the auxiliary rudder by the follow-up action, will not move as far as *c* is displaced but will reach a point where there is equilibrium between the forces on the two rudders.

Now suppose that the pulley *c* is held while the main rudder is forcibly displaced. The action of the mechanism is such as to swing the auxiliary rudder in the same direction and with greater velocity. The effect is shown by the dotted line in Fig. 12. It will be seen that the auxiliary rudder acts to oppose any undesired disturbance of the main rudder, and furnishes an automatic control over the position of the main rudder.

The actual mechanism used for operating the rudder is shown in Figs. 13 and 14. This system of gearing replaces

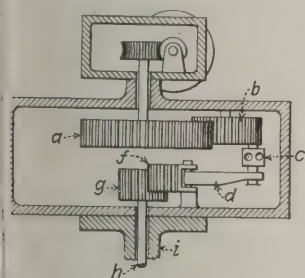


Fig. 13

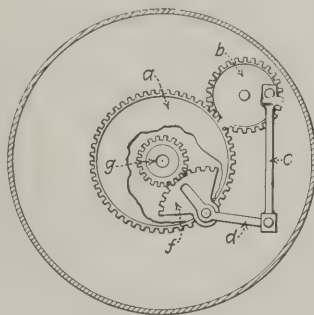


Fig. 14

the simple arrangement shown in Fig. 12. The operation of the rudder from the bridge is effected by hand, even with large ships. A cable leads from the steering wheel on the bridge to the so-called upper box which contains a worm and worm wheel. The gear wheel *a* is the main direction element and corresponds to the pulley *c* of Fig. 12. If this gear is turned, it acts to turn the operating shaft of the auxiliary rudder through the arrangement of gears and levers shown. The main gear box is attached to the main rudder stock. The operating shaft for the auxiliary rudder extends down through the hollow main rudder stock and connects to the auxiliary rudder by yokes and parallel rods.

The events that occur in the transition from going ahead to astern are illustrated in Fig. 15. In this example, the main rudder and the auxiliary rudder are both shown making a 0-degree angle with the direction of the ship. Upon reversing the engines, the current swings the main rudder around until it makes an angle of 180 degrees with the ship's head. The successive positions of the two rudders are shown in this figure. When the rudder reaches the 180-degree

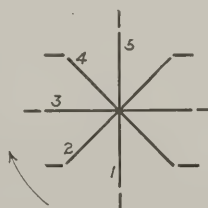


Fig. 15

position the auxiliary rudder is ready to take up the control of the main rudder again. It is unnecessary for the helmsman to wait for the rudder to complete its swing. Instead he may immediately turn his wheel for heading the ship in the desired direction after reversing.

SAVING IN POWER EFFECTED

The following considerations indicate how great a saving in power may be expected for the steering gear. Instead of the large main rudder it is only necessary to operate a small rudder having about one-twentieth of the main rudder surface. A further saving arises from the fact that this rudder will not assume positions in which the center of pressure travels far from the axis, while with the normal rudder, under certain circumstances, the center of pressure may even reach the middle of the rudder. Under such circumstances, the strain on the steering gear is very great. Owing to the fact that such exceptional demands are not made on the steering gear with the current actuated rudder, the total saving in power, including also that due to the smaller area of surface moved directly, may amount to 97 percent.

INSTALLATION ON THE FRIGIDO

Toward the end of 1920, the installation of the new rudder was begun by Wilton's Machine Fabriek en Scheepswerf of Rotterdam on the refrigerator ship *Frigido* of the firm of Wm. H. Mueller and Company. Since the spring of 1921, this ship has operated without interruption upon the routes London to Rotterdam, London to Antwerp, and London to Hamburg. The rudder has been proved by test on the *Frigido* in the busy Thames as well as in severe storms on the North Sea.

The operation of the rudder is carried on by hand gear from the bridge. A wire rope lead of 4 millimeters diameter runs from an automobile steering wheel to a small gear box on the hollow main rudder stock. The section chosen for this rudder is that cross section which gives the greatest rudder action for the least movement of the rudder, and has no apparently greater influence on the ship's resistance than the plate rudder.

It must be emphasized that the exact orientation of a rudder to the current has great influence upon the maneuvering power. Since the helmsman cannot take into consideration the changes of direction of the current leaving the ship, frequently the normal rudder is placed in positions very unfavorable for best steering, and furthermore the speed of the vessel is checked. Since the new rudder is influenced by the current, it automatically places itself in such a position relative to the altered current that it draws the greatest steering effect therefrom.

ACTION OF FLETTNER RUDDER STEADIES THE SHIP

A property demonstrated on the *Frigido* is the great steadiness of the rudder action on the ship. This property is due to the very prompt response of the rudder and also to the fact that with the normal rudder, which is fixed, the ship is affected by all the changes in the current about it, both from the waves and from possible changes in the propeller action as the ship is thrown about. As a consequence, the ship is continually being thrown off her course by such influences which cannot be seen by the helmsman. Such behavior is suppressed by the current actuated rudder. The force of the waves has no such effect, since the rudder yields and is then immediately restored to position. It is interesting to observe in heavy weather how the main rudder indicator continually plays back and forth while the ship holds steadily on her course.

A safety factor with the current actuated rudder is the circumstance that the main rudder stock carries no torsion. Nevertheless the dimensions are made in accordance with the rules of the classification societies since they must con-

sider the possibility that the auxiliary rudder may fail. For this same reason, the ship carries the customary emergency steering gear.

Testing Marine Boilers in France

By A. M. Thachara*

ACCORDING to French laws providing for the safety of navigation, new boilers, before being installed in vessels for which they are intended, must undergo a preliminary test at the works of the boiler constructors. The first trial at the works consists of a hydrostatic test at a pressure higher than that at which the boiler will be run under ordinary conditions. This pressure may reach twice the ordinary pressure, but the regulations do not permit excess pressure thus applied to exceed 142 pounds per square inch (10 kilograms per square centimeter).

When installed in a ship, all new boilers must undergo an additional cold water test at a pressure exceeding by one-half that indicated on the boiler as the regulation pressure permitted, but the excess pressure must not be less than 7.12 pounds ($\frac{1}{2}$ kilogram) or greater than 88.3 pounds per square inch (6 kilograms per square centimeter). As a general rule the length of time during which the boiler is subjected to the excess pressure varies from 5 to 10 minutes.

EXEMPTION FROM OFFICIAL TESTS

Boilers which have passed the tests of recognized classification societies and which have been granted a first class certificate by such societies do not have to undergo the above mentioned official tests, as the societies' certificate is accepted by the French government.

*U. S. Consul General, Paris, France.

The Comité Central des Armateurs de France (French Ship Owners' Syndicate) states that the government and classification societies' boiler tests are practically identical, but that the hydrostatic test is not always insisted upon by the societies and that it is left to their experts to decide as to the desirability of such trials. As a result, it sometimes happens that boilers in French ships have never undergone the official hydrostatic test.

According to regulations, steamship boilers are inspected every year, and subjected to a pressure test every four years. The boiler is tested at a pressure equal to one and a half times that indicated and stamped on the boiler as being the normal pressure, but the excess pressure must not be less than 7.12 pounds ($\frac{1}{2}$ kilogram) or greater than 88.3 pounds per square inch (6 kilograms per square centimeter). The pressure test is made by the French authorities, who, however, exempt from such further tests, vessels holding a first class certificate from a classification society.

In addition to the four-year test, trials are likewise imposed by the regulations when boilers have undergone extensive repairs.

DECREASING THE PRESSURE RATING

The proprietor of a vessel is entitled, at the time of inspection of a boiler, or when the four-year test takes place, to request that the pressure rating stamped on the boiler be lowered, if the boiler has already been in use or has undergone extensive repairs or has been in service more than a year since the expiration of validity of the last navigation certificate. In such cases the tests are made on the basis of one and a half times the new pressure rating asked for, the excess pressure not to be less than 7.12 pounds ($\frac{1}{2}$ kilogram) or more than 88.3 pounds per square inch (6 kilograms per square centimeter). If the boiler satisfactorily passes this test, the new rating is stamped on the boiler in lieu and place of the original figure.



A Replica of the Clermont, Robert Fulton's First Practical Steamship, Which Will Be Used by Marion Davies in Her New Production, Entitled "Little Old New York." The Ship Is an Exact Counterpart of the Replica Used in the Hudson-Fulton Celebration and Was Built by the Kingston Dry Dock Company.

Zinc Coatings for Shipbuilding Purposes Galvanizing and Sherardizing

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

THIS article has to do with the galvanizing or sherardizing of iron and steel members, fastenings, fittings, etc. of vessels, particularly those subject to salt water or salt air corrosion. A zinc coating is the most permanently efficient practicable method yet devised for protecting iron and steel from such corrosion; and it is therefore used wherever something better than paint or bituminous coatings is demanded. Although such a coating is usually for the purpose of adding to the useful life of the articles coated, it is often also desirable to avoid the streaking and discoloration of adjacent work by rust which would occur if the articles were not properly protected from corrosion. The zinc coating can be applied by hot process galvanizing, electro-galvanizing or sherardizing.

Whatever process is used, the articles have to be thoroughly cleaned, and the surface freed of scale, rust and grease. Acid is usually required in the cleaning process, together with the use of stiff brushes or mechanical tumblers. In some cases sand blasting or sand rolling in tumbling barrels takes the place of the acid. The sand blasting is particularly desirable with porous or bad castings, or where the pickling would impair the strength of the article.

HOT PROCESS GALVANIZING

Hot process galvanizing, which until about the beginning of this century was the only successful method of galvanizing, is accomplished by giving the articles a proper cleaning and drying and then dipping them in molten zinc. Large articles should be preheated so as not to chill the bath. When the articles are withdrawn from the bath, the excess metal is shaken or wiped off, and they are then usually dipped into oil or water. The process is simple, and produces a thick, durable covering of zinc.

This coating is smooth when properly done but has a leamy and sometimes uneven and poor appearance, and paint or other coatings, where required, will not adhere to it until the coating has weathered or been specially treated. Small holes are filled up by this process of galvanizing, and bolt threads and other parts of that nature have to be recut or cleaned out, thus destroying the value of the coating on such parts of the work. The coating is thicker than required for most services, thus being wasteful of zinc. It is generally between 2 ounces and 3 ounces per square foot. There are also considerable losses of zinc in the process. Hot process galvanizing cannot be used for springs and other articles which would lose their temper or be weakened, warped or otherwise injured by the heat treatment.

ELECTRO-GALVANIZING

Electro-galvanizing is simply electro-plating with zinc, and all the technical requirements for successful electro-plating have to be complied with. The surfaces must be chemically clean and the articles must be placed in the plating tanks

in a way to secure good electrical contact and a reasonably uniform deposit of the metal, and be left there a sufficient length of time to obtain the necessary thickness of coating. Up until about 1900 it was considered impossible to obtain a solution, or electrolyte, that with the use of zinc anodes would produce a non-porous and adherent sheet covering of zinc; but about that time inventions embodying the use of special materials in the solution such as a small amount of aluminum, which solved the difficulty, established electro-galvanizing on a commercial basis.

It can be readily realized that electro-galvanizing requires considerably more skill and care than hot process galvanizing, and that in an attempt to expedite delivery or to increase profits the coating may be too thin to afford efficient protection. When well done it is attractive in appearance and can be polished up if desired but all irregularities or imperfections in the surface of the article are faithfully reproduced in the coating. Other coatings, where desired, will adhere well to it.

Electro-galvanizing is particularly desirable for articles that are simple in form, for articles that might be weakened or otherwise injured by heat treatment, for springs, screens, bolts, pipe fittings, etc. Threads do not require recutting after electro-galvanizing. Interior surfaces of articles of considerable length and small cross section are apt to receive only a thin deposit of the metal from anodes outside of the article, and the bottoms of screw threads and similar recessed portions receive less of the metal than the other surfaces.

SHERARDIZING

In the process of sherardizing, the articles to be coated, after thorough cleaning and drying, are placed in a revolving container in an electric furnace with alternate layers of zinc dust. The zinc is first reduced to a gas by the heat of the furnace and this gas solidifies on and partly amalgamates with the surfaces of the articles to be coated. The result is a uniform and particularly efficient anti-corrosive coating. Considerations of practicability and cost usually limit its use for shipbuilding purposes to such articles as are difficult to galvanize properly or which when galvanized would require sufficient subsequent expense for cleaning out, fitting, etc., not required when sherardized. It is particularly desirable for surfaces subject to abrasion and for bolts, nuts, washers and small or intricate pieces that might be filled in by the hot process galvanizing or have some surfaces which would probably not obtain a sufficient thickness of coating by electro-galvanizing. It cannot be used for springs or other articles which would lose their temper or be otherwise injured by the heat treatment.

The coating has a uniform gray color which is attractive in appearance. It is one to which paint, enamel or electro-plating of other metals will readily adhere.

SELECTION OF TYPE OF COATING

Desires of naval architects and other interested parties are apt to be factors in determining the type of coating to use,

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

in addition to considerations of suitability, availability of the process, cost and appearance. Where a vessel is classed the classification society requirements have to be met.

Hot process galvanizing is the method which by virtue of established position may be expected to receive general approval, and there should be no question of the approval of sherardizing for those items for which it is likely to be proposed. In some cases a classification society, owner or naval architect may consider it advisable to require hot process galvanizing of steel fastenings where they would allow electro-galvanizing if the fastenings were of iron, or they might require hot process galvanizing where the vessel is salted and allow electro-galvanizing where the creosote preservative method is adopted, or again they might require the former process for fastenings passing through oak, where the latter would be approved for fastenings through yellow pine. The corroding properties of oak have been referred to in the writer's article in the October, 1921, issue of this magazine. Electro-galvanizing has, however, made such strides in recent years that classification societies may be expected to give it general approval for all purposes for which galvanizing is required for shipbuilding, subject to the usual inspection given all such material in which they are interested and any tests that they may consider advisable to determine whether a sufficient thickness of coating has been obtained.

The U. S. Bureau of Standards in 1918 made a number of tests to determine relative values of hot process galvanizing and electro-galvanizing and the results obtained gave them no reason to believe that for an equal weight of zinc per unit of area the former was superior to the latter. Electro-galvanized specimens taking into account coating thicknesses withstood the salt spray test referred to later as well as, if not better than, specimens galvanized by the hot process, and the average weight losses per day under that treatment were practically identical for the two processes.

TESTS OF ZINC COATINGS

The Bureau of Standards have also tried out different methods of testing zinc coatings. They came to the conclusion that the copper sulphate test for galvanizing or sherardizing was undesirable and that the salt spray method was the most satisfactory. For a quick test to determine the weight of zinc coating they have recommended the antimony chloride stripping test. They consider that the protective value of a coating as shown by the salt spray test is a better indication of its value than the actual thickness of the coating; and have suggested that samples be tested in this way and that if this test indicates a satisfactory coat, similarly treated samples can be stripped of their coating and the amount of zinc be used in checking up the work from day to day by the stripping method, with only occasional salt spray check tests.

These tests are very clearly described in the proceedings of a conference on the electro-plating of military supplies which was held at the Bureau of Standards on March 27, 1918, and the recommendations of this conference together with other valuable conclusions along the line of zinc coatings are here quoted. About fifty persons were present at this conference, representing various branches of the War and Navy Departments, manufacturers engaged on Government contracts, officers and members of the American Electroplaters' Society, and manufacturers of and dealers in plating supplies and equipment. The recommendations are:

1. For protection of iron and steel against corrosion, only zinc coatings should be employed.
2. It is not practical to specify the composition of solutions or conditions of operation to be employed for plating.
3. In the preparation of steel and iron for plating, sand blasting should be given preference to pickling.
4. Some form of corrosion test, such as the salt spray test, should form the primary specification for the quality of zinc

plating; the quantity of coating to be suggested only as a secondary specification.

5. Where the quantity of zinc coating is to be suggested or specified, it should be expressed in terms of weight per unit area (or piece) as determined by some stripping test.

The reasons for and application of the above recommendations were set down as follows:

USE OF ZINC COATINGS

Numerous exposure and accelerated corrosion tests have confirmed the superior value of zinc coatings over copper nickel or brass coatings for protection against corrosion. In view of this fact, it seems highly important that wherever protection of steel against corrosion is an important factor, zinc coatings should be employed. (Note: While this conference was concerned only with electroplating, it should be borne in mind that satisfactory zinc coatings may be produced by hot dipping, sherardizing and electroplating, so-called "electro-galvanizing.")

COMPOSITION OF PLATING SOLUTIONS

Desirable as it might be to insure uniformity of product by specifying the composition of plating solutions and conditions of operation to be employed, such a course is entirely impracticable, for the following reasons: (a) The best conditions of operation have never been definitely determined. (b) A large number of plating plants have neither the equipment nor experience necessary to analyze the solutions and control the conditions of operation. (c) Most platers have become accustomed to certain solutions and conditions of operation, and would find it difficult to obtain satisfactory results under new conditions. (d) Restricting the composition, etc., might exclude many satisfactory processes, and would discourage efforts to improve conditions of operation. Illustrations were given in the conference, of the confusion arising from attempts to specify the exact composition of solutions for black nickel finish.

SAND BLASTING VERSUS PICKLING

It has been frequently shown that under some conditions serious weakening or embrittlement of steel may be produced during the pickling and plating operations. This effect, presumably due to the occlusion of hydrogen, is a surface effect, and is therefore more serious the smaller the cross-section, so that on fine springs, etc., pickling cannot be used. Experiments are in progress at the Bureau of Standards to determine the magnitude of such effects upon steel rods of various sizes and compositions. The results so far obtained upon 3/16-inch rods indicate that pickling under usual conditions reduces the elongation by about 10 percent, while the effects of plating itself are generally much less. In view of this fact it appears desirable to replace pickling by sand blasting (or sand rolling) whenever possible.

CORROSION TESTS

Where zinc plating is applied to steel to produce resistance against corrosion, it is obvious that some form of corrosion test is the only real criterion of the quality of the coating, since the resistance furnished by a given quantity of zinc depends on a number of factors; e.g., the structure, uniformity, continuity, and adherence of the coating, all of which may in turn be influenced by the thoroughness with which the object is cleaned prior to plating. At the present time the "salt spray test" is probably the most reliable means of testing the resistance to corrosion afforded by a zinc coating. In practice the coating should be required to withstand corrosion for a specified number of days when exposed continuously at room temperature to the spray of 20 percent (by weight) sodium chloride solution. The number of days may vary with the needs; e.g., two or three days for articles subjected to moderate exposure, or four days or more for extreme

exposure; e.g., on marine fittings. The essential features of the salt spray test to produce fairly uniform results are as follows:

SALT SPRAY TEST

The salt spray test may be conducted in any convenient non-metallic box or vessel provided with an inclined cover so as to prevent dripping of condensed liquid upon the specimens. A box constructed of Alberene stone, glass, stone-ware, or wood coated with bituminous paint, may be used. (The cut illustrates such a test apparatus.)

The 20 percent salt solution is prepared by dissolving 20 grams of sodium chloride (commercial table salt) in 80 cubic centimeters of water, or 1 pound of salt in 2 quarts of water.

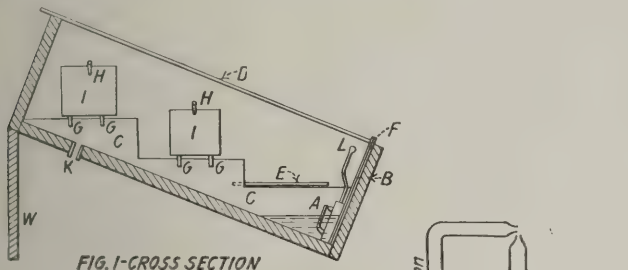


FIG. 1-CROSS SECTION



- A... Atomizer
- B... Stone Box
- C... Cut Stone Supports for Samples
- D... Heavy Glass Top
- E... Glass Baffle Plate
- F... Glass Plate to Support (D)
- G... Glass Strips to Support Samples
- H... Overhead Support for Samples
- I... Samples
- K... Opening for Exhaust
- L... Air to Atomizer
- S... Salt Solution
- W... Blocks to Support Box

FIG. 2-TOP VIEW

Salt-Spray Box for Accelerated Corrosion

The spray may be produced by any form of air injector which will yield a very fine mist. An air pressure of 6 to 10 pounds per square inch will probably be required. The compressed air should first be passed through water in order to remove dust or grease and to saturate it with water vapor and thereby avoid evaporation of the salt solution. A glass baffle plate should be so placed as to prevent the spray from blowing directly against the specimens. The articles to be tested should each be suspended or supported, for example from glass rods, in as nearly a vertical position as possible, and should not be in contact with metal. They should be removed and washed off at 24-hour intervals or at the end of the specified period of test, and examined for the presence of red or yellow iron rust, the first appearance of which marks the conclusion of the test period. Valuable information may, however, be frequently obtained by continuation of the test to determine the extent of the corrosion on longer exposure.

COPPER SULPHATE TEST

It is recognized that a simpler and more rapid form of corrosion test to determine the quality of zinc coatings, is highly desirable. The Preece test (immersion in copper sulphate solution) was discussed at some length in the conference, and it was generally agreed that while it is of some value under strictly uniform conditions to indicate the thickness or distribution of the zinc coatings, the results of the

test are not sufficiently reliable to warrant its use in specifications.

ANTIMONY CHLORIDE TEST

In some cases it may be desirable to supplement the salt spray requirements by a statement of the quantity of zinc coating probably necessary on a given article to produce the desired resistance. The quantity of zinc coating on any small articles may be quickly determined by a stripping test, e.g., by lead acetate or antimony chloride solution, and may serve as an indication of whether the coating is of uniform weight on different samples, and approximately equal in amount to the coating on similar specimens which have passed the salt spray test. For irregular or threaded parts, the antimony chloride method is recommended. It is carried out as follows: A sufficient number of specimens should be used in each test to have an area of not less than 25 square centimeters (4 square inches). They are weighed (to the nearest milligram) and then dipped in 100 cubic centimeters (or more if necessary to cover the specimens) of concentrated hydrochloric acid (specific gravity 1.20) to each 100 cubic centimeters of which has been added 5 cubic centimeters of a solution made by dissolving 20 grams of antimony trioxide in 1,000 cubic centimeters of concentrated hydrochloric acid. The same portion of hydrochloric acid may be used repeatedly up to five times, by adding before each immersion an additional 5 cubic centimeters of the antimony chloride solution. The samples are immersed in the solution for one minute. They are then washed and scrubbed in running water to remove the deposited antimony, and are dried and reweighed. The loss in weight represents the weight of the zinc coating, which is calculated directly to grams per square decimeter; or to ounces per square foot by multiplying the grams per square decimeter by 0.328 (or for practical purposes, by dividing by 3). Often it may be most convenient, on irregular shaped parts, to express the weight in grams (or milligrams) per piece, thereby avoiding uncertainty as to the exact area of a specimen.

TOLERANCES

Consideration of the tolerances necessary and permissible upon threaded or other dimensioned parts, to allow for the thickness of metallic coatings, showed that the maximum tolerance possibly required (e.g., 0.0025 inch on each surface) will not cause sufficient weakening of the threads as to be objectionable. For most plating applications it is probable that a tolerance of 0.001 inch on each surface will be sufficient.

The Bureau of Standards have supplemented the above mentioned recommendations as to the time that an article should resist the salt spray test by suggesting a test period of about 8 days as desirable for marine work. They have also expressed the opinion that one ounce of zinc per square foot of surface exposed, representing about .0017 inch in thickness, will give satisfactory protection, although as before stated they consider the protective value of the coating as shown by the salt spray test a better indication of its value than the actual thickness of the coating.

NEW AUXILIARY SCHOONER LAUNCHED.—The steel three-masted auxiliary schooner *Hussar*, which is being built from the designs and under the supervision of Cox & Stevens, naval architects, New York, by Burmeister & Wain, Copenhagen, Denmark, for Mr. Edward F. Hutton, New York Yacht Club, was successfully launched on March 15. This vessel, which will be one of the most superb auxiliary yachts in the world, is equipped with a 600 horsepower Burmeister & Wain Diesel engine operating a two-bladed feathering propeller, and will be delivered to Mr. Hutton in the early summer.

The Merchant Marine Problem Can Be Solved

Now Is the Time for Every Real American
to Renew the Fight All Along the Line

By "Old Scotch"

IN spite of a decided majority of the votes in the United States Senate, on every test given, the Administration's shipping bill was killed, through the bitter opposition of a coterie of misguided members, who refused to listen to reason, who absolutely ignored facts and who were determined, fanatically, to kill any kind of a measure which would help the American merchant marine. Their antics demonstrated to the people of the United States that our "most deliberative legislative body on earth" is ruled by a minority, and not by the majority.

It is not for us to rail at the unfairness of the entire Senate procedure, time will bring its own revenge, and the enlightened voters of this country will eventually take care of the men whose machinations in the Senate have made popular government farcical, in this, as well as in several other important legislative programs. Fair minded men would have permitted a vote, but radicals rule for a time, until aroused public sentiment comes to the rescue. Time and again in the history of Congress, this element has thwarted the will of the people, but soon they have returned to the oblivion from which they sprung. So let's dismiss this sore subject from our thoughts and look ahead.

As the experience of the past is the best guide for the future, the men interested in shipping, and especially those in the Government who are managing any legislation for the betterment of the merchant marine conditions, will do well to studiously avoid any more "next session" postponements. People familiar with Washington always take this "next session" talk with a grain of salt, and, in fact, look upon it as tantamount to an acknowledgement of defeat. In this case there seems a well-defined impression that some of the weak-kneed among Republican leaders put it over on President Harding's affable nature by their lamentations of possible defeat if the bill had been pressed during July and August. It could have been passed then, as the climate of the Capitol City has a very enervating and withering effect on filibustering tactics. Long distance talkers, soaked in perspiration, soon shut up. With visions of green fields and fence building at home, the farm "bloc" would have probably succumbed, when the humidity along the Potomac approached the saturation point, as it has a habit of doing in mid-summer.

SHIPPING SHOULD BE NON-PARTISAN ISSUE

Another most important thing to avoid in shipping legislation of the future is the injection of party politics. As no Democrats were called in from the Hill when the ill-fated bill was in the making, the minority party naturally concluded that it was to be passed as a purely Republican measure. Partisan politics are never injected in legislation for the Army and Navy, and the merchant marine is just as much a national issue as are these two great arms of the national defense.

Neither the Republican nor the Democratic party platforms is ever framed without the inclusion of a plank pledging the respective parties to the upbuilding of American shipping. True, they generally differ as to the means advocated, but they have the same patriotic object to accomplish. Such a spectacle as the minority party calling a caucus and deciding on party opposition should never be allowed to occur again. The political differences should be threshed out before the introduction of the bill, and then let it be considered on its merits alone.

The one outstanding feature of all the debates on the late bill, was that no one seriously antagonized the idea of our having our own ships to carry our own products to foreign markets. In fact had a vote been taken on that question in the abstract it is doubtful if it would ever have been necessary to have had a roll call on the subject, as the sentiment in its favor would practically have been unanimous.

With such a sentiment as a decided asset for the proponents of an American merchant marine, and with eight months' time intervening before Congress again assembles in regular session, it behooves all elements interested in advancing our shipping to get together and formulate a policy which will arouse no opposition of a partisan nature. From statements in the public press, Chairman Lasker is quoted as saying that a new bill will be prepared and presented to the next Congress by the President in December. Just what form such a measure will take is, at this writing, a matter of great conjecture. In addition to the many real experts now in the Shipping Board, there seems but little doubt that before any measure is decided upon, the opinions of experts outside the governmental circles will be asked and given serious consideration.

PREFERENTIAL DUTIES OF DOUBTFUL VALUE

Means for accomplishing the desired end are by no means exhausted in the failure of the so-called subsidy bill. Differential duties on imports are still authorized, and need but the annulment of some existing treaties to be put in effect. Now that this procedure is a possibility without further Congressional action, many shipping men are giving the subject serious consideration. Many well-informed men are doubtful as to the ultimate benefits to be derived from a reduction of duties on imports, if the goods are carried in American bottoms, for the reason that our principal imports are not of a bulky nature. While our exports reach an enormous tonnage, the same cannot be said of imports, for the reason that many of them come under the characteristics of luxuries or semi-luxuries and, in consequence, are valuable but not very bulky. For example, the following imports arranged according to value, have been received at our great port of importation, New York city, during the past six months:

Sugar, tobacco, woolen fabrics, cotton fabrics, vegetable fibers, diamonds and precious stones, silk manufactures, china and earthenware, fruit and nuts, clocks and watches, iron and steel manufactures, drugs and chemicals, perfumery and cosmetics.

Sugar, of course, is dutiable and of great bulk; it therefore would encourage considerable American tonnage. Manufactured silk, diamonds and precious stones, clocks and watches, drugs and chemicals, etc., on the contrary while of considerable intrinsic value would do but little to encourage shipping, owing to the small weight and volume entailed in their transportation overseas.

Customs differentials would, of course, help considerably but without other governmental aid it is doubtful if they would solve our problem.

SALE OF VESSELS AT LOW RATE WILL HELP

It is within the power of the Shipping Board to establish real help for the next few years, at least, by selling the b

the ships to private American owners, at such a low rate that the interest, depreciation and insurance charges would be so small as to offset in the operating costs, the proposed direct aids contained in the recent ill-fated Merchant Marine Act of 1922. Naturally such a procedure would provide nothing for the highly essential replacement fund which all successful private corporations must consider. It would also work an injustice to the so-called pioneer purchasers of Shipping Board tonnage, except that by the purchasing of additional tonnage from the same source at much lower rates, the average cost of their equipment would be greatly lowered. Consideration should be given to the possibilities of utilizing enlisted men from the regular Navy to man ships in the foreign trade, on the basis of a Naval Reserve, the Government to pay half their wages and the private shipowners the remainder. As it is incumbent upon the Navy to operate private shipping in times of war, it cannot be denied that the training of men to operate merchantmen is as essential as it is to train them to operate purely fighting craft. Such an arrangement would quite manifestly overcome the wage differential between American and foreign ships. Many of our competitors now adopt this method although the proportion of pay from the governments involved is much less than herein proposed.

REMOVE THE INEFFICIENT TONNAGE

A great deal of discussion is now going on as to the disposition of the useless idle tonnage. The proposal to get rid of some 400 or 500 of the least efficient ships by scrapping or sinking at sea is one that should be given most careful attention. There is no doubt whatever that such craft should be withdrawn from any possible commercial usage, for the best interests of all concerned. But to deliberately sink that many craft, where there is no possible chance of further usage, even in time of possible great emergency, is a very serious question.

Would it not be better to select out the unfit vessels, withdraw them from any possible sale in time of peace, and store them as far as possible up some of the many available rivers, where the water is entirely fresh? A dozen men employed to prevent pilferage should suffice for each hundred of these ships. If we but recall how many vessels, which had been

stranded for a number of years, were floated, patched up, and performed really valuable services when the great demands incident to war were on, it is not difficult to conclude that even for a period of ten years, these partly abandoned vessels might prove to be a great asset should any future emergency arise when the whole world may be clamoring again for "Ships, ships and yet more ships."

True, it might be necessary to provide new boilers, condenser tubes, and other parts vulnerable to the ravages of oxygen, but the point is that without any care involving expense, the hulls and heavy parts of machinery of such ships stored in fresh water, would be fit to use again. It would be much cheaper to patch up such old hulks than it would be to construct entirely new vessels at the inflated prices attending all great emergencies.

The setback we have received by the inanition of the Senate should not discourage us. We have received similar jolts before, but realizing that we are right, we should all keep up our courage and renew the fight all along the line.

Propellers

(Continued from page 222)

a high figure for the resistances of the ship and is therefore of very little value for the purpose of arriving at true figures.

Owing to the very small actual twist in a ship's shafting, readings by torsion meter are naturally very small and when a ship is laboring at sea they become quite definitely inaccurate. For this reason some better means of arriving at the Q.H.P. might be tried, such as the use of an electric or mechanical flexible coupling, the displacement of the two flanges being calibrated for torque before installation on board ship.

The Shipping Board can do no greater favor to the ship operating industry than to initiate accurate tests on one or two freight ships. First, in the tank, with and without propeller, and later with instruments for carefully recording both the torque and the thrust. Tests with this device would have to be made at all speeds in smooth water over a deep water course and this could then be carried out also on one transatlantic voyage.



The First Vessels for the Irish Navy

(Photograph by Kadel and Herbert, N. Y.)

The three vessels shown in the above illustration are the first ships purchased by the Irish Free State. They are the first vessels to fly the Irish ensign, and will be fitted out as gunboats for patrol work.

Current Admiralty Decisions of Special Interest

By Calvert B. Gill*

Breach of Affreightment Contract

THE rights and liabilities of the parties depending on general rules of maritime law are not subject to material alteration by State enactments declaring vessels navigating the waters of the State subject to a lien for damages resulting from nonperformance of affreightment contracts. The lien against a vessel for damages resulting from a breach of an affreightment contract does not attach before the cargo is delivered to and received on board the vessel.

Since the lien on a vessel for damages caused by a breach of an affreightment contract and the lien of the vessel on the cargo for the freight are mutual and reciprocal, receipt of part of the cargo called for by the contract does not entitle the shipper to a lien on the vessel for damages caused by its refusal to receive the rest of the cargo called for by the contract. *Osaka Shosen Kaisha et al. vs. Pacific Export Lumber Company*, 43 Supreme Reporter, 172.

Necessary Act of Sacrifice Comes Under General Average

ALL losses in a maritime adventure falling outside the contractual obligations of the parties and which arise from a voluntary sacrifice of a part of the cargo, made to save the whole adventure from perishing, or which arise out of extraordinary expenses or expenditures of money incurred for the joint benefit of both ship and cargo constitute a claim to general average contribution. It was said in the case of *Aktieselskabet Fido vs. Lloyd Brasileiro et al.*, 283 Federal Reporter, 62, that where a charterer, who had chartered the vessel for transportation of coal, delivered sufficient cargo at port of discharge under previous charter for stiffening but the coal so delivered was overheated at port from which the coal was to be transported, requiring the discharge of such coal and the loading of entirely new cargo, the loss caused by the delay constituted a claim to general average contribution since there was an imminent peril common to all interests, a voluntary, deliberate and intentional necessary act of sacrifice or expenditure made to preserve all interest and the act was attendant with success and the peril avoided.

Where a Release Signed by a Seaman Should Be Set Aside

THE release signed before a shipping commissioner by discharged seamen on settlement of their wages for the time served, as required by the Revised Statutes of the United States, section 4552, does not operate as a consent to their unlawful discharge. Although section 4552 provides that a release signed by a seaman thereunder on receipt of wages, "shall operate as a mutual discharge and settlement of all demands for wages," the Seamen's Act of March 4, 1915, section 4, provides that the court may upon good cause being shown, set aside such release and take such action as justice shall require. It was said in the case of

Brown et al. vs. United States, 283 Federal Reporter, 425, that where seamen discharged without their consent or fault before commencement of the voyage, who were entitled under the Revised Statutes of the United States, section 4527, to an additional month's wages, were compelled to sign such a release to obtain payment of the wages admittedly due them, the release would be set aside and held not a bar to their recovery under section 4527.

Concerning Changes in Wages

WHEN shipping articles have a provision in them, providing that the wages named were subject to change in accordance with a new scale to be adopted by shipowners, the court declared in *Jones vs. United States*, 284 Federal Reporter, 721, that the articles were invalid as they did not comply with the statute requiring the articles to state the wages to be paid, notwithstanding Revised Statutes of the United States, section 4511 provides that the articles may contain stipulations in reference to advance and allotment of wages, or other matters not contrary to law.

Injuries Sustained by Stevedoring Employees

IN *Farrell vs. Waterman Steamship Corporation et. al.*, decision of January 25, 1923, the court says, that District Courts have jurisdiction in Admiralty of personal injury cases concerning employees of stevedoring companies notwithstanding the Act of Congress of June 10, 1922, as the provisions of the Act, denying to District Courts jurisdiction in cases of injuries to persons other than the master or crew of vessels for which compensation is provided by State acts, are unconstitutional under Article 3, sections 1 and 2 of the Constitution of the United States.

Ship's Liability When in Charge of Stevedores

ASHIP, in safe condition when placed in charge of a stevedoring company as an independent contractor for discharging and loading, is not liable in Admiralty for injuries to employee of such company by falling through a hatchway due to the negligence of the stevedoring company in leaving the hatchway uncovered after work had ceased at night and insufficiently lighted and also to contributory negligence of the employee, who knew of the open hatchway and with due care would have avoided it. *The Kongosan Maru*. 282 Federal Reporter, 666.

Seamen's Liability Cases in State Courts

ALTHOUGH the liability of an employer to a seaman injured in his employment was defined by the maritime substantive law, it was said by the court in *Bonam vs. Southern Menhaden Corporation*, 284 Federal

*Attorney at law, Baltimore, Md.

Reporter, 362, that where the seaman elected not to seek redress in Admiralty, but to come into the law court, his remedial rights were governed by the procedure of the latter court and as limitations pertain to the remedy and not to the right, the defendant had the right to invoke the statute of limitations of the State, where there was no Federal statute of limitation. As there are no statute of limitations in Admiralty, the court may, in its discretion, apply the doctrine of laches as equivalent so that statutes barring old or stale claims are persuasive, but not controlling in Admiralty cases.

Properly Manned Condition Should Be Strictly Construed

THE Harter Act, section 3, exempting a ship and owner from liability for loss resulting from faults or errors in navigation, if due diligence has been exercised to make the ship seaworthy and properly manned, equipped and supplied, should be strictly construed, says the court in *The Port Morgan*, 284 Federal Reporter, page 1, especially where exemption is claimed for losses due to stranding of the ship which was caused by the gross negligence of the engine room force, which had been selected by the owners without exercising the proper care required by the Harter Act in equipping and manning a ship.

Payment for Towage Contract

WHERE a contract for towage was made with charterer's undisclosed principal and one-half thereof was paid by such principal within thirty days after rendition of services and the principal was granted an extension of time for the payment of the other one-half, but payment thereof was not made because of the insolvency of the principal and where the charter provided for the payment of towage by charterer, there was no maritime lien for the unpaid one-half of the towage, even if a claim for towage could be maintained as a necessity within the Act of June 23, 1910, giving a maritime lien for necessities. *The Mona*, 282 Federal Reporter, 468.

GREAT LAKES VESSEL LAUNCHED.—Specially designed for service on the Canadian Lakes and canals the *Glencorrie*, a single screw steamer, was successfully launched by Swan, Hunter, & Wigham Richardson, Ltd., from their Wallsend Yard on March 1. The principal dimensions are 250 feet in length between perpendiculars, 42 feet 6 inches in width, with a molded depth of 20 feet 6 inches. Water ballast will be carried in the fore peak and in the double bottom fore and aft. The propelling machinery consisting of a triple expansion engine and two single-ended Scotch boilers built by MacColl and Pollock, Ltd., Sunderland, is located aft.



©Keystone View Co., N. Y.

United States Battleship Colorado, Sister Ship of the California, Nearing Completion at the Yard of the New York Shipbuilding Corporation, Camden, N. J.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Determining the Strength of a Hollow Shaft and Coupling

Q. (1188).—Will you please show me how to find the strength of a hollow shaft and the strength of a coupling to suit a hollow shaft?—L. T.

A. (1188). To better illustrate the method to be followed in the design of marine shafting, an actual case of a hollow line shaft with its coupling will be worked out for a triple expansion three cylinder engine of 1,800 indicated horsepower and 90 revolutions per minute.

A = actual metal area of shaft cross section, square inches.

D = diameter of hollow shaft in inches.

D_s = diameter of solid shaft in inches.

E = effective thrust on shaft in pounds.

$E.H.P.$ = effective horsepower for designed speed of vessel.
= 0.55 (assumed) $\times$ 1,800 = 990.

F = weight of shaft per running inch, in pounds.

L = greatest distance from center to center of bearings in inches = 144 (assumed).

S = speed in knots = 14.

T = maximum twisting moment on shaft, inch pounds.

d = diameter of shaft bore, in inches (= $0.6 \times D$ assumed).

f = maximum allowable combined stress, pounds per square inch = 5,500 (60,000 pounds material assumed).

f_b = bending stress due to own weight, pounds per square inch.

f_s = shearing stress due to torsion, pounds per square inch.

f_t = compressive stress due to thrust E , pounds per square inch.

k = constant depending upon number and arrangement of cylinders.

= 1.8 for single crank.

= 1.4 for two cranks at 90 degrees apart.

= 1.32 for three cranks at 120 degrees apart.

$0.92 \times I.H.P. \times k \times 63,024$

$T = \frac{\text{R.P.M.}}{\text{R.P.M.}}$

$0.92 \times 1,800 \times 63,024$

90

$S.H.P. \times 63,024$

(T for turbine shafts = $\frac{\text{R.P.M.}}{\text{R.P.M.}}$)

A rough estimate should first be made to determine the shaft diameter based upon solid shaft calculations.

$$D_s = \sqrt[3]{\frac{5.1 \times T}{f_s}} = \sqrt[3]{\frac{5.1 \times 1,159,700}{5,500}} =$$

10.24 square inches.

To determine the approximate outside diameter of a hollow shaft of the same strength, proceed as follows:

Where diameter of hole = $0.4 D$ add 1 percent
= $0.5 D$ add 2 percent
= $0.6 D$ add 5 percent
= $0.7 D$ add 10 percent } to D_s

Therefore $D = 10.24 \times 1.05 = 10.75$

As the above calculations do not take into account bending and compressive strains it is safe to assume our shaft will be at least 11 inches diameter.

Shaft Diameter, Inches

D (assumed)	11	12	13
$d = 0.6 D$ (use nearest even value)	6.625	7.25	7.75
$D^4 =$	14,641	20,736	28,561
$D^2 =$	121	144	169
$d^4 =$	1,926	2,763	3,608
$d^2 =$	43.89	52.42	60.06
$L^2 =$	20,736	20,736	20,736
$E.H.P. \times 33,000$			
$E = \frac{S \times 101.33}{4 F L^2 D}$	23,030	23,030	23,030
$F =$	17.21	20.40	24.30
$f_b = \frac{\pi (D^4 - d^4)}{4 F L^2 D}$	396	360	334
$A =$	60.56	71.82	85.56
$f_t = \frac{E}{A} \left(1 + \frac{16 L^2}{25,000 (D^2 + d^2)} \right)$	448	367	302
$f_s = \frac{5.1 T D}{D^4 - d^4}$	5,156	3,943	3,080
$f_a = f_b + f_t$	844	727	636
$f = \frac{1}{2} f_a + \frac{1}{2} \sqrt{f_a^2 + 4 f_s^2}$	5,545	4,324	3,416

Plotting values of D against values of f , the outside diameter D corresponding to the designed stress of 5,500 is found to give a diameter of 11.03 inches. The shaft would be 11 inches outside diameter and 6 $\frac{5}{8}$ -inch bore.

The material of the coupling will be taken as cast steel with a maximum tensile strength of 60,000 pounds per square inch.

Working stress allowable = 5,500.

Keys to be of same material as the shafting and designed for a safe crushing load of 11,000 (f_c) pounds and a shearing load of 4,500 (f_s) pounds per square inch.

D_1 = diameter of shaft in hub = $1.1 \times D = 1.1 \times 11$
= 12.1 inches, approximately 12 $\frac{1}{8}$ inches.

W = width of key.

B = length of key.

n = number of keys

	1	2	3	4
$B \times b = \frac{2 T}{D_1 \times f_c \times n}$	17.38	8.69	5.793	4.345

	42.5	21.25	14.17	10.625
$W \times B = \frac{2 T}{D_1 \times f_s \times n}$				

$$\frac{2.445}{b} = \frac{2.445}{2.445} = \frac{2.445}{2.445} = \frac{2.445}{2.445}$$

$$\text{one key} = \frac{d}{4} + \frac{1}{8} \text{ inch}$$

$$\begin{cases} \text{two keys} = d/5.5 + \frac{1}{8} \text{ inch} \\ \text{three keys} = d/7 + \frac{1}{8} \text{ inch} \\ \text{four keys} = d/8.5 + \frac{1}{8} \text{ inch} \\ \text{Use one key.} \end{cases}$$

$$W = \frac{D}{4} + \frac{11}{4} \text{ inch} = \frac{11}{4} + \frac{1}{8} \text{ inch} = 2\frac{7}{8} \text{ inches}$$

$$\begin{aligned} b &= 2.875 \div 2.445 = 1.176 = 1 \frac{3}{16} \text{ inches} \\ B &= \text{length of key, also length of hub} = 17.38 \div 1.1875 \\ &= 14.64 \text{ inches} \\ &= 14\frac{5}{8} \text{ inches} \end{aligned}$$

$$\begin{aligned} D_2 &= \text{diameter of hub} = \frac{4T}{f_s D_1 B} + D_1 + 2b \\ &= \frac{4 \times 1,159,700}{5,500 \times 12.125 \times 14.625} + 12.125 + (2 \times 1.1875) \\ &= 19\frac{1}{4} \text{ inches.} \end{aligned}$$

The maximum permissible length of the coupling should be about 4 times the hub thickness.

Assume no taper to coupling bolts and the material to have a 60,000-pound maximum tensile strength. Safe shearing stress = $f_s = 4,500$ pounds per square inch.

$$\begin{aligned} d_1 &= \text{diameter of bolt, inches} = 1\frac{3}{4} & 2 & 2\frac{1}{4} \\ d_2 &= \text{nuts across corners} = 3.1875 & 3.594 & 4.031 \end{aligned}$$

$$c = \text{clearance between nut and hub, inches} = \frac{5}{8} \quad \frac{3}{4} \quad \frac{7}{8}$$

$$c_1 = \text{corner of nut to flange edge, inches} = \frac{3}{8} \quad \frac{3}{8} \quad \frac{3}{8}$$

$$\begin{aligned} D_3 &= \text{diameter of bolt circle, inches} \\ D_2 + 2c + d_2 &= 23\frac{3}{4} \quad 24\frac{3}{8} \quad 25 \end{aligned}$$

$$\begin{aligned} A &= \text{shearing area of bolt, square inches} = 2.405 \quad 3.142 \quad 3.976 \end{aligned}$$

$$P = \text{load at bolt circle} = \frac{2T}{D_3} = 97,660 \quad 95,160 \quad 92,760$$

$$N = \text{number of bolts} = 8 \quad 8 \quad 8$$

$$f_s = \frac{P}{8 \times A} = 5,075 \quad 3,785 \quad 2,916$$

Use eight 2-inch diameter bolts.

$$\begin{aligned} D_4 &= \text{diameter of flange} = D_3 + d_2 + 2c_1 \\ &= 24\frac{3}{8} + 3\frac{5}{8} + (2 \times \frac{3}{8}) = 28\frac{3}{4} \text{ inches.} \end{aligned}$$

The flange thickness is usually based upon an empirical proportion.

$$= 1.35 d_1 \text{ for cast iron}$$

$$= 1.15 d_1 \text{ for cast steel and wrought steel.}$$

$$= 1.15 \times 2 = 2.3 \text{ inches, use } 2\frac{3}{8} \text{ inches.}$$

It is assumed in your problem that I.H.P. (indicated horsepower) was inadvertently used in place of S.H.P. (shaft horsepower) as the shaft is for a turbine and not a reciprocating engine.

$$T = \text{maximum turning moment} = \frac{\text{S.H.P.}}{\text{R.P.M.}} \times 63,024$$

$$= \frac{7,500}{570} \times 63,024 = 829,400 \text{ inch pounds.}$$

$$D = \text{diameter of shaft, inches} = 7$$

$$d = \text{diameter of shaft bore, inches} = 3.5$$

$$f_s = \text{stress due to torsion, pounds per square inch} = \frac{5.1 T D}{D^4 - d^4}$$

$$\begin{aligned} &= \frac{5.1 \times 829,400 \times 7}{(7)^4 - (3.5)^4} = 13,153 \end{aligned}$$

The shaft material has a maximum tensile strength of 62,000 to 70,000 pounds which would not permit of a working stress of over 5,700 to 6,500 pounds per square inch. The shaft is therefore too small for good marine practice.

The above work is believed to be in sufficient detail as to method to enable you to work out your own coupling stresses as space does not permit of further discussion of the subject.

NEW BOOKS

Diesel Engines for Land and Marine Work

Reviewed by L. R. Ford*

DIESEL ENGINES FOR LAND AND MARINE WORK. (Fifth edition). By A. P. Chalkley. Size, 5 by 8½ inches. Pages, 330. Illustrations, 161. New York, 1922: D. Van Nostrand Company.

This book as originally issued was the admirable result of the effort of the author to meet the need for a treatise that would supply a fund of general information to both the technical reader and the non-technical seeker after information regarding the Diesel engine.

The increasingly widespread use of the Diesel engine and the fact that practically all important marine engineering firms are prepared to manufacture it in one form or another have resulted in the development of new types and the improvement of old ones, to such an extent that the author has found it necessary to revise the book in order to bring it up to date. Notwithstanding the intensive development of the Diesel engine and the great refinement of mechanical details that has resulted, the basic principles of Diesel engine design, manufacture and operation have not changed enough, to require any change in the text in the first six chapters of the book.

Chapter seven has been entirely re-written and enlarged and it is now a profusely illustrated description of most of the leading types of engines, including the latest and most radical departure from conventional design, the Still combined Diesel and steam engine. Chapters eight and nine are but slightly changed from the original editions.

It is to be regretted that, apparently in order to save space, the section devoted to small Diesel marine engines was glossed over very hurriedly. The development of these small engines has been so great since the first edition of the book that the author would have been justified in expanding this section to make an additional chapter. Such engines as the Leissner, Worthington, Berrz, Hvid, Crossly, Deutz, etc., are being produced in such numbers that the total horsepower in operation already probably exceeds that of the larger types but they have not received notice in the book. It is perhaps unfair, however, to demand more when the author has collected so much valuable information.

The outstanding physical feature of the book is the number and clarity of cuts with which the text is illustrated.

Only enough space is given to theoretical considerations to enable the reader to understand the why and the how of engine operation and the book should be of great value to the very large number of operating steam engineers who are seeking general information regarding the Diesel engine and especially to the marine steam engineers who wish to qualify

*Manager of Diesel engineering department, Morse Dry Dock and Repair Company, Brooklyn, N. Y.

for examination for license as Diesel engineers. To the technical reader the book's chief value is as a source of information regarding general details of construction as worked out by the various manufacturers.

The author's treatment of his subject indicates a very broad knowledge of practical Diesel engineering and everyone who has been for years familiar with his book in its various editions will welcome the new and up to date information contained in this enlarged edition.

PERSONAL MENTION

C. S. DORAN, vice-president and general manager of the Sperry Gyroscope Company, Brooklyn, N. Y., recently sailed for England.

H. J. BRADLEY has been appointed San Francisco branch manager of the Chicago Pneumatic Tool Company to succeed J. K. Haigh.

J. F. BORELAND, vice-president of the Huhn Manufacturing Company, New York city, is on an extended business trip to Japan and Hawaii.

A. P. LANE, fuel director of the State of Maine, was recently elected for membership to the Maritime Association of the Boston Chamber of Commerce.

D. A. DECROW, manager of the Water Works Department of the Worthington Pump and Machinery Corporation, New York, recently died at his home in East Orange, N. J.

CAPTAIN HERBERT HARTLEY, commander of the American liner *St. Louis* during the war, has been appointed master of the *Leviathan*. As master of this liner, which will be placed



Captain Herbert Hartley

in the New York-English Channel service under the flag of the United States Lines probably in June, Capt. Hartley becomes commodore of the largest fleet of passenger vessels under the American flag.

WALTER MAUGHAN has been appointed manager of the steamship passenger business of the Canadian Pacific Railway on both the Atlantic and Pacific oceans. During the war Mr. Maughan did valuable work as chairman of the Demobilization Committee of the Canadian Railway War Board representing the Minister of Militia and was made a

lieutenant-colonel in recognition of his work in the transportation of troops from Canada and China to France. Mr. Maughan was born in Toronto in 1876 and joined the Canadian Pacific forces in 1892. In 1897 he was made city passenger agent at Toronto and in 1913 district passenger agent. In the same year he was moved to Montreal as assistant general passenger agent and in December, 1922, became assistant to the general passenger traffic manager.

CALVIN AUSTIN, president of the Eastern Steamship Lines, Inc., has been elected president of the Old Dominion Steamship Company, recently acquired by the Eastern Steamship Lines. H. H. Walker, of New York, formerly president of the Old Dominion Line, has been elected vice-president.

JOSEPH S. JONES, who was recently appointed vice-president of Charles Cory and Son, Inc., New York, was born in Norfolk, Va., on March 1, 1888. His academic and



Joseph S. Jones

technical education was obtained at St. Mary's Academy and Columbia University. Mr. Jones served a special apprenticeship course in naval, electrical and mechanical engineering at the Navy Yard, Norfolk, Va., for which he received the Secretary of the Navy's certificate and award. The positions that have been held by Mr. Jones are as follows: Hull draftsman, Navy Yard, Norfolk; electrical draftsman; electrical expert aide; senior electrical expert aide and assistant electrical superintendent; electrical superintendent (acting) in charge of

naval electrical work including the fitting out of transport and the conversion of the ex-German liners in the Third Naval District to troopships; engineer and assistant to the vice-president, Charles Cory and Son, Inc., and general commercial manager and assistant to the president of the same company since 1921.

Mr. Jones has invented several mechanical improvements and equipment in the marine field, the principal of which are an electro-mechanical dry dock control system which is the first and only system of its kind in use; special watertight indicating rotary snap switches; a cutting machine for removing the cover on leaded and armored cable; watertight lighting fixtures; train semaphore signal system; valve position indicating system; watertight deck plug and receptacle; system of installing storage batteries in submarines interior fittings for watertight connection boxes.

He is also author of several technical and scientific treatises covering various types of signaling and power equipment for the Navy Department; specifications used in connection with the conversion of merchant vessels to transport and the electrical work required for preparing ex-German ships for the transport service. He is also author of "Ship Telegraphs and Their Uses." Mr. Jones served in Battery B, First Battalion, Virginia Field Artillery for four years (Norfolk Light Artillery Blues). He is a member of the American Institute of Electrical Engineers, Society of Naval Architects and Marine Engineers, New York Southern Society, the Virginians, New York Electrical League, the Old Colony and the Knickerbocker clubs.

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

Seventeen Millions in Ship Work

APPROXIMATELY seventeen million dollars in ship construction and reconditioning work is either about to be placed or is under serious consideration for the near future, according to latest information obtainable by MARINE ENGINEERING AND SHIPPING AGE. These figures, while forming a necessarily tentative estimate of the total involved, provide for the construction of five combination passenger and cargo ships and the reconditioning of six others.

The situation in regard to new construction is as follows: preliminary plans are in course of preparation by Theodore E. Ferris, naval architect and marine engineer of 30 Church Street, for two passenger and freight ships for the Clyde Line; two passenger and freight ships are contemplated for the Old Dominion Line; bids were received on March 20, and are now under consideration, for the building of one ship for the New York & Porto Rico Line. Tenders are also being received for the building of five self-propelled barges and forty cargo barges (all of steel construction) designed by the firm of Kindlund & Drake, naval architects and marine engineers of 17 Battery Place. The probable cost of these vessels as well as eight ferryboats to be built for the City of New York is not included in the figures given above.

In reconditioning work the market shows decided improvement with the outlook much brighter than it has been in many weeks. Contracts next in size to the *Leviathan* job are seen in the proposed reconditioning of the *Agamemnon* and *Mount Vernon*. The firm of Gibbs Brothers, Inc., No. 1 Broadway, who prepared the plans and specifications for the *Leviathan* work, have accepted a like contract in relation to the *Agamemnon* and *Mount Vernon*. Additional steel construction work on the hulls of these ships to increase their stability is under investigation, which, if carried out, will add materially to the original cost estimates.

Shipyards are at present preparing to submit bids on April 2 for the thorough reconditioning of the steamer *President Buchanan* and plans and specifications have been issued from the Shipping Board, at 45 Broadway, for the carrying out of alteration and additions to the steamship *President Adams*.

\$100,000,000 Asked for New York City Issues Plans and Specifications for Eight Ferryboats to Cost \$1,475,000

ACCORDING to the last bulletin of the Atlantic Coast Shipbuilders' Association, the Navy Department in the preliminary estimates for the next budget asking for an appropriation of almost \$100,000,000 for auxiliary craft, cruisers and submarines.

These estimates are a part of the policy which has been recommended by the General Board for the purpose of bringing the United States Navy up to treaty strength in auxiliary craft. The entire program, which probably will be worked out on a three-year basis, calls for sixteen light cruisers of 1,000 tons with eight-inch guns and twenty-four submarines of 2,500 tons, half mine layers and half scouts, the cost of the completed program will approximate \$300,000,000. The General Board recommends that six or eight of the cruisers and six of the submarines be provided for by the next Congress.

Bids Open April 12 for River Towboat Hull

SEALED proposals will be received by the United States Engineer Office, Rock Island, Ill., until 11 A. M., April 12, furnishing and delivering one steel hull for the towboat *Elinor*.

PLANS and specifications for the construction of eight steel screw ferryboats have been issued by the Department of Plant and Structures of the City of New York. It is estimated that the total cost of the contract will be close to \$1,475,000. The amount of security to guarantee the faithful performance of the work will be \$50,000 for each boat and the first boat is to be delivered, entirely completed, within 140 consecutive days from the date of certification of the contract and thereafter one boat is to be delivered complete every twenty days.

GENERAL DIMENSIONS

The specifications (A, B, C and D) provide for the construction, equipment and delivery of eight ferryboats, each having a length over guards of 130 feet, beam over guards 52 feet, beam of hull molded 36 feet, draft 8 feet 6 inches. The vessels are to be double-ended, constructed for the carrying of passengers and vehicles, each boat having three team gangways and two cabins on the main deck. The vessels are to be constructed according to the requirements of the American Bureau of Shipping.

SPECIFICATION "B"

Specification "B" provides for the installation of single expansion, non-condensing steam engines for propulsion and steam operated auxiliaries, steam being generated in fuel oil fired boilers together with all necessary piping, fitting, etc., the hulls to be as specified with such modification as may be necessary for the proper installation of such machinery and equipment as called for in the specification.

Under this specification each engine is to have two cylinders not less than 16 inches in diameter and a stroke of not less than 18 inches, the engine developing sufficient horsepower at a speed of 180 revolutions per minute and at a steam pressure of 125 pounds to drive the boat at a speed of ten nautical miles an hour. The propellers are to be of open hearth cast steel, the shafts being of forged steel. There are to be two tanks for fuel oil, having a total capacity of 8,000 gallons and also two water tanks, having a capacity of not less than 1,500 gallons each.

Each boat will have two approved Scotch marine boilers not less than 7 feet in diameter by 11 feet 6 inches long, the boilers

to pass the requirements necessary for 180 pounds working pressure.

EQUIPMENT

Each boat will have an approved feed water heater of the multicool type, cast iron shell and copper or brass tubes, and to be arranged to take exhaust from the main engine; two approved horizontal feed pumps, $7\frac{1}{2}$ by $4\frac{1}{2}$ by 10 duplex or equivalent, pumps to be brass fitted; one approved horizontal fire pump, $7\frac{1}{2}$ by $4\frac{1}{2}$ by 10 duplex or equivalent, also to be brass fitted; Ashton type safety valves; boats to be steam heated, electrically lighted; life boats and similar equipment, according to United States laws.

SPECIFICATION "C"

Specification "C" provides for the installation of compound condensing engines for the propulsion of the vessels and steam operated auxiliaries, steam being generated in fuel oil fired boilers, together with all necessary pipings, fittings, etc. In this case, the boats are to have two approved compound, 2-cylinder engines with all appurtenances, the cylinders to be not less than 12 inches with 24 inches diameter and the stroke not less than 18 inches.

EQUIPMENT

Under this specification the equipment will include: the air pump, $7\frac{1}{2}$ inches by 14 inches by 10 inches; vertical simplex beam air pump, having one steam cylinder, brass fitted throughout; one main condenser, independent of main engine; the cooling surface to be at least 1,200 square feet measure on the outside of the tubes; and one side inlet centrifugal pump of sufficient capacity, direct connected to an engine of sufficient power.

SPECIFICATION "D"

Specification "D" provides for propulsion of each boat by a vertical 6-cylinder, single acting, direct reversing, heavy duty oil engine (marine type) in which ignition is dependent solely on the temperature of compression. The engine must be of suitable design for direct connection to propeller shafting at both ends. The engine must be guaranteed to develop sufficient shaft horsepower to drive the boat at ten nautical miles an hour with piston speed under 760 feet per minute at revolutions not to exceed 190 per minute.

The boats, under this specification, are to be equipped with an approved generator having a continuous duty rating of 40 kilowatts, 115 volts at the normal speed of the engine, direct connected to an approved vertical fuel oil engine to provide current to light the boat and to drive the following motor driven auxiliaries with which the boat is to be equipped.

Auxiliaries	Horsepower of Motor
Two steering engines.....	8
Circulating water pump.....	5
Fire and general service pump.....	10
Maneuvering air compressor.....	15
Fuel oil pumps.....	5

Each boat is also to be equipped with the following motor driven auxiliaries, connected up and ready for use: auxiliary air compressor with a capacity of 40 cubic feet of free air per minute; circulating water pump, with a capacity of 7,500 gallons per hour with a reserve unit of equal capacity; fuel oil pump, with a capacity of 2,100 gallons per minute with a reserve unit of equal capacity.

Electric steering engines of approved design are to be provided and each boat will be equipped with an approved fuel oil burning boiler with piping of sufficient capacity to heat the cabin and pilot houses.

Homer Ferguson Tells Propeller Club United States Cannot Maintain Position Without Strong Merchant Marine

WE have one thing at least in connection with the defeat of the recent shipping bill that we ought to be thankful for, said Homer L. Ferguson, president of the Newport News Shipbuilding and Dry Dock Company, in addressing a recent luncheon at the Propeller Club, and that is, that we don't have to listen any more to the opinions of Congressmen representing various sections of the country, and this also applies as well to editors of newspapers, including some of New York city's leading dailies, who know next to nothing about the problems of the shipping industry.

In speaking of the present situation, he pointed out that a large number of Shipping Board vessels should be sunk or scrapped. In fact, he declared that if they were operated they would surely break the company that tried to run them. The first thing to be done in stabilizing the present situation is to get rid of inefficient Government tonnage.

Mr. Ferguson spoke very earnestly and feelingly about our naval sea power and he hoped that the ten-year holiday would carry

with it a program for strengthening our merchant marine, for that must be done if the United States is to maintain her position. Whatever nation controls transportation will also control the politics and welfare of the world, he declared.

The time has not come when you can leave your business to others, said Mr. Ferguson, and in his opinion to scrap 11 battleships that cost over \$300,000,000 and then allow our chief competitor to build two more in order to catch up with us was an idiotic policy.

In speaking of constructive economic laws, Mr. Ferguson believed that we never again, in our time at least, would be able because of the strength of financial interests to pass an economic measure unless it had the support of both parties. In regard to shipping, he pointed out that all you had to do to find out why the shipping bill did not pass was to pick up a list of the directors of English shipping lines. The answer is that plenty of ships exist and the other fellow has got them.

Referring to the Jones Act, Mr. Ferguson declared that the clauses seeking co-operation with the railroads had never been enforced and railroad interests were arrayed against American shipping. The transportation Act, he said, which practically guarantees a 5½ percent return to the railroads on their net investment, may not be a subsidy but at least it is a very substantial aid.

SENATOR COPELAND TO SUPPORT SHIPPING

Senator Royal S. Copeland pledged his support to American shipping in every way that he could conscientiously. Senator Copeland said that the evidence of prosperity in any country was shown by its seaports and that unless the Government recognized all elements that make for prosperity good times could not be permanent. He did not believe that any country was pursuing a wise policy unless it made ample provision for its shipping and its seaports to secure the carriage of its products. The senator made a stirring plea along the lines recently advocated by Colonel Roosevelt, namely: that individual citizens inform themselves concerning the merits of public questions.

SHIPPING POLICY MUST BE NON-PARTISAN

Winthrop L. Marvin, vice-president and general manager of the American Steamship Owners' Association, said that any constructive shipping policy should have the support of both parties and our merchant marine as our Army and Navy must be made a non-partisan issue.

Personal

G. H. FROEBEL, formerly manager of the Houston, Texas, branch office of the Westinghouse Electric and Manufacturing Company, has been appointed manager of the marine sales department of the company, effective April 1 with headquarters at the East Pittsburgh works of the Westinghouse Company.

JOHN N. ROBINS, founder of the Robin Dry Dock and Repair Company, Brooklyn, N. Y., and for many years associated with William H. Todd, president of the Todd Shipyards Corporation, died on March 25 at his home in Greenwich, Conn., aged 71.

Cooperation of Shipping Industry Sought

Questionnaires Issued Relating to Best Means for Disposing of Government Fleet

THE committee of the Shipping Board, consisting of Commissioners Lissner, Thompson and Chamberlain, who were appointed to study and prepare details of a plan for transferring Government vessels to private ownership, issued invitations to the American Steamship Owners' Association, the United States Ship Operators' Association and the Council of American Shipbuilders to send committees to Washington during the last week in March.

The result of these conferences is not known at the time this is written but the main questions under consideration were as follows:

1. In your opinion could buyers be found for Shipping Board vessels who would give a guarantee to maintain those vessels upon a prescribed service, if the Board, in return for this guarantee, expressed the willingness to sell the ships in question at less than the world market price for similar tonnage?

2. Over what period of time do you believe it is practicable to require a guarantee of service?

3. What in your opinion should be the nature of this guarantee?

4. What in your opinion should be the Board's policy with regard to the sale of good tonnage which is not required for operation upon desirable trade routes, especially as to (a) sale to citizens, (b) sale to Aliens?

5. What in your opinion should be the Board's policy with regard to tonnage which is inferior in design, equipment or general condition?

6. To what extent and on what terms can capital be raised upon shipping in today's financial market, and what can be recommended to facilitate the financing of purchases from the Board?

American Ship and Commerce Corporation Makes Big Gain

THE consolidated income account of the American Ship and Commerce Corporation for 1922, after deducting fixed charges, shows a profit of \$1,790,610.39, as compared with \$1,045,084.46 for 1921, according to the annual report recently made public. The aggregate net income of the parent company and its subsidiaries was a profit of \$2,545,770.95, against a loss of \$711,445.38 for 1921, or an increase of about \$3,250,000.

The report shows a considerable decrease in the surplus account, from \$5,466,000 in 1921 to \$975,000 in 1922. This decline, it is explained, is due to the sale of seven cargo vessels, upon which there was a loss of \$2,111,000, and the adjustment of values of other ships to accord with market values.

The parent company received dividends of \$3,264,472 from its stock in the William Cramp & Sons Ship and Engine Building Company, which, it is understood, was utilized in the purchase of the new passenger steamers *Resolute* and *Reliance*. The report states that new loans of \$5,000,000 were made during the year to finance the purchase of these ships, which works out at the rate of about \$145 a gross ton.

"The betterment in the operation of the shipping companies was \$1,620,000 and in the shipbuilding and manufacturing approximately \$1,540,000. The improvement in the case of the shipping companies may be explained as follows:

"1. The sale of seven cargo vessels, after several months' idleness, resulted in materially reducing costs by the elimination of lay-up charges and depreciation.

"2. Reductions in the operating and up-keep expense of the entire fleet.

"3. The profitable showing made by the new first-class steamers *Resolute* and *Reliance*."

The report says that the industrial activities of the company, carried on largely through Cramp's, are proving profitable and are steadily increasing in volume and importance. At present all the manufacturing plants of the Cramp company and its subsidiaries are running at capacity and further expansion will be necessary.

R. H. M. Robinson, president of the American Ship and Commerce Corporation, states that the failure of the ship subsidy bill does not materially affect the company's prospects, as the *Reliance* and *Resolute* have been transferred to the Panama flag, and other plans have been made without counting upon government support. The outlook for shipping generally, he says, depends upon adjustment of the financial and economic difficulties in Europe.

Income of New York Shipbuilding Corporation Reduced

The depression in shipping, the limitation of armaments and cessation of construction for the Shipping Board resulted in a considerable decrease in the business of the New York Shipbuilding Corporation in 1922, according to the annual report made public last month.

Net income for the year was \$1,026,267, at the rate of about \$5 a share, as compared with \$1,996,559 in 1921 and \$2,395,402 in 1920. Dividends were paid at the rate of \$1.50 a share, as compared with \$4 a share in the previous two years. Surplus for the year amounted to \$726,267, which made the total surplus \$6,140,905, subject to Federal income taxes.

The gross income last year amounted to \$1,184,517, against \$4,899,671 in 1921. Nothing was charged to amortization of plant, as compared with \$1,943,386 for this purpose the previous year.

Ships Ordered in 1923

DURING the first quarter of 1923 contracts were placed in American shipyards for 85 vessels of various types, including two express passenger steamers for coastwise service, a 13,000-ton freighter for the Great Lakes, seven Diesel-engined craft, a number of tugs, two dredges for the government, and a large fleet of steel barges for inland waterways service.

The vessels ordered since the first of the year are as follows:

Two passenger steamships, 402 feet by 72 feet 6 inches, to Sparrow's Point Plant of Bethlehem Shipbuilding Corporation, Ltd. by Eastern Steamship Lines, Inc., Boston, Mass., price \$3,600,000.

Two fishing steamers, one 140 feet long and the other 135 feet long, to M. M. Davis & Son, Baltimore, Md.

Combination towboat and lighter, 90 feet by 20 feet, to Vineyard Shipbuilding Company, Milford, N. J., by Cuban-American Sugar Company.

Bulk freight steamship, 604 feet by 60 feet by 32 feet, to Toledo Shipbuilding Company, Toledo, O., by Reiss Steamship Company, Sheboygan, Wis.

Steam lumber schooner of 1,200,000 feet capacity to Peninsular Shipbuilding Company, Portland, Ore., by A. B. Johnson Lumber Company.

Maneuver boat to Midland Barge Company, Midland, Pa., by U. S. Engineer Office, Huntington, W. Va., price \$21,475.

Dipper dredge hull to Penn Bridge Company, Beaver Falls, Pa., by U. S. Engineer Office, Pittsburgh, Pa., price \$23,145.

Three steel deck barges to the Independent Bridge Company by U. S. Engineer Office, Pittsburgh, Pa., price \$40,000.

Self-propelled houseboat, 60 feet by 16 feet 4 inches, to George T. Johnson and Sons, Cambridge, Md., for Charles B. Bossett, Brooklyn, N. Y., price, \$25,000.

Eight steel barges, 140 feet by 25 feet by 11 feet, and one barge, 280 feet by 50 feet by 11 feet, to Alabama Dry Dock and Shipbuilding Company, Mobile, Ala., by the Tennessee Coal, Iron and Railway Company.

Two steel oil burning tugboats, 105 feet 9 inches by 24 feet by 12 feet 9 inches, to Tebo Yacht and Basin Company of Todd Shipyards Corporation, by Standard Transportation Company, New York.

Five steel barges to Green Bay Dry Dock Company, Green Bay, Wis., by U. S. Engineer Office, Milwaukee, Wis.

Two Diesel towboats, 63 feet by 14 feet, to Hildebrand Shipyards, Kingston, N. Y., by Transmarine Corporation, New York, price \$75,000.

Steel oil barge to Los Angeles Shipbuilding and Dry Dock Corporation, Los Angeles, Cal., by Associated Oil Company, price \$45,000.

Two Diesel ferry boats, 120 feet long, to St. Helen's Shipbuilding Company, St. Helens, Ore., by Long-Bell Lumber Company.

One tug, 58 feet, by 17 feet by 8 feet, to the Erie Basin Shipyard, Buffalo, N. Y., by the Niagara Ferry and Transportation Company.

Four steel barges to the Nashville Bridge Company, Nashville, Tenn., by U. S. Engineer Office, Florence, Ala.

Pipe line dredge, 175 feet by 50 feet by 8 feet, to the Charles Ward Engineering Works, Charleston, W. Va., by U. S. Engineer Office, Cincinnati, O., price \$275,000.

Fourteen steel barges, 100 feet by 25 feet by 5 feet, to the Penn Bridge Company, Beaver Falls, Pa., by U. S. Engineer Office, Nashville, Tenn., price, \$156,535.

Three steel barges, 80 feet by 26 feet by 5 feet, to the Riter-Conley Manufacturing Company, Pittsburgh, Pa., by U. S. Engineer Office, Huntington, W. Va., price, \$32,190.

Four steel dump scows, 144 feet by 37 feet by 11 feet 8 inches, to the Newport News Shipbuilding and Dry Dock Company, Newport News, Va., by U. S. Engineer Office, Philadelphia, Pa., price, \$190,000.

Two motorships to Great Lakes Engineering Works, Detroit, Mich., for Minnesota Atlantic Transit Company, Duluth, Minn.

One oil barge, 87 feet by 28 feet 4 inches by 8 feet, to the Noank Shipyard, Inc., Noank, Conn., by U. S. Engineer Office, Philadelphia, Pa., price, \$21,900.

Twenty steel barges to the American Bridge Company, Ambridge, Pa., by Pittsburgh Coal Company, Pittsburgh, Pa.

America Contract Goes to New York Navy Yard

THE reconditioning and conversion of the steamship *America* into a cabin and third-class liner is to be carried out by the New York Navy Yard. The decision to award the contract to the Navy Yard, according to reports, was due to a belief on the part of Shipping Board officials that all bids were too high and that this matter could be adjusted more expeditiously by giving the job to the Navy Yard on the cost basis. The board appears to be uncertain as to the amount of work it will authorize but it is by no means uncertain in its decision to return the *America* to its berth in time to meet her sailing date of June 2.

It is not clear why this contract could not have been adjusted just as satisfactorily at a guaranteed price with private repair plants. Certain it is that the total bids submitted, including the Navy Yard estimate, did not vary materially and surely not enough to guarantee that the price of the job on the cost basis would not exceed the bid of the lowest bidder—the Morse Dry Dock and Repair Company.

According to Mr. E. P. Morse, president of that company, the Shipping Board had no choice in calling for figures from the Navy Yard because there is a law specifying that when work done on a Government-owned or controlled vessel exceeds \$100,000 in cost the nearest available navy yard must have a chance to estimate. Notwithstanding this law, the award of the job to the Navy Yard brought immediate protests from individual plants on the ground that the Navy Yard had no overhead or capital charges to meet and still further that it was not fair to tax commercial enterprises so that the money could be used to undermine their business.

Idle American Seagoing Tonnage Shows Decrease

ONLY a little more than 10 per cent of privately-owned American ocean-going steam tonnage was unemployed on January 1, 1923, according to a summary statement issued recently by the American Steamship Owners' Association, 11 Broadway. On July 1, 1922, 15.7 per cent of American ocean-going steamships was unemployed; on January 1, 1922, 23.5 per cent was unemployed.

Idle privately-owned American steamers numbered only 92 of a total of 320,405 gross tons register on January 1, 1923, as compared with 124 of 522,567 tons on July 1, 1922, and 171 of 780,653 tons on January 1, 1922.

This present improvement in the business of American shipping, according to Winthrop L. Marvin, vice-president and general manager of the American Steamship Owners' Association, "is due mainly to improved business within the protected coastwise trade of the United States, including the intercoastal trade via the Panama Canal."

To Build Two Barges

SEALED proposals will be received at the United States Engineer Office, Galveston, Tex., until 2 P. M., April 16, 1923, for furnishing and delivering two 1,200-barrel steel barges complete, afloat at any port on the Gulf of Mexico accessible to a seagoing tug drawing 12 feet of water.

Intercoastal Services Still Rapidly Growing

Shows What American Shipping Can Accomplish Under Favorable Conditions

THE increased activity in the movement of cargoes in the intercoastal trade is the most marked development in the employment of ships under the United States flag, during the past year. The employment of privately owned ships in the trade with other countries, where keen competition makes economical operation imperative and where our ships are handicapped by high operating costs has rapidly decreased; so rapidly in fact that at the close of the last quarter of 1922 our privately owned cargo tonnage was represented in the foreign trade by only 119 vessels, of which 61 were engaged in trade with the West Indies and Caribbean countries. Of the balance engaged in overseas trade, 26 were vessels owned by the large industrial companies engaged principally in the transport of their own products. Thus it will be seen that our privately owned American vessels on whom the burden of competition with foreign carriers falls are represented by a meagre total of 32 vessels. Other than the vessels of the United States Shipping Board, our merchant marine in foreign service does not equal the fleet of one good-sized British company.

PRIVATE VESSELS SEEK INTERCOASTAL BERTHS

The vessels under private ownership have practically abandoned the hopeless task of competing with the more cheaply operated foreign fleets, and have turned to the protected traffic of our coastal waters, where the basis of operation cost is equal, and an opportunity is presented of making a profit through increased efficiency in fair competition. A survey of the intercoastal business for the last quarter of 1922, shows how rapidly commerce can be developed where American shipping is not throttled by the lower operating costs which prevail on the vessels of other nations.

Secret Oil Deal Suspected

SENATOR ROYAL S. COPELAND, in an address before the Propeller Club on March 23, declared that the private car of Harry F. Sinclair, head of the Sinclair Oil Company, stood on a siding at Three Rivers, New Mexico, for three days just before the tremendous oil deposits at Teapot Dome, Wyoming, were leased to the Mammoth Oil Company.

Three Rivers is the home of Albert B. Fall, former Secretary of the Interior, and it will be remembered that the Teapot Dome wells, formerly known as Naval Petroleum Reserve Number 3, were removed from the jurisdiction of the Navy Department to the Department of the Interior. The lease was signed on April 7, 1922, but not made public until April 14, 1922.

The State of Wyoming and Secretary Edwin Denby protested against the lease and Senator La Follette caused a senatorial investigation of the deal to be made. It is believed that the lease was made without competitive bids and Senator Copeland pointed out that it was significant that just before the lease was made Mr. Sinclair's private car was held on a siding at Three Rivers for three days. Senator Copeland said that he was not through with this Teapot Dome episode.

For the last three months of 1922 the total cargoes moving in intercoastal trade amounted to 1,227,612 long tons, of which 336,691 tons were oil cargoes in tankers. The movement in eastbound traffic from the Pacific to the Atlantic and Gulf ports, excluding the oil cargoes, amounted to 479,144 long tons, while the westbound movement from the Atlantic and Gulf to Pacific ports amounted to 411,777 long tons.

RAPID INCREASE IN OIL CARGOES

The rapid increase in the movement of oil cargoes from the West Coast to the Atlantic is worthy of special comment at this time. The mounting output of the California oil fields guarantee us against curtailment of supply in case any large percentage of productive wells in the Mexican fields should run to salt water. The total oil movement by ship from the West Coast amounted in the last quarter of 1922 to 335,191 long tons or about 2,300,000 barrels, an increase over the previous three months of approximately 1,000,000 barrels.

For the same quarter, our imports of oil from Mexico amounted to 4,102,000 long tons, or approximately 28,000,000 barrels, a decrease from the figures for the corresponding period of 1921 of 1,368,000 long tons or about 9,425,000 barrels. This decrease has practically been absorbed by the development of the California fields and a decided increase in the movement of tankers in intercoastal trade is noted.

The general growth of the intercoastal business has greatly increased the number of vessels employed, and new companies have entered the field with large, well-equipped vessels. There were 143 vessels of 1,356,584 deadweight tons employed during the last three months of 1922, as compared to 93 vessels of 912,570 deadweight tons employed during the previous quarter. The total sailings from Atlantic to Pacific ports during the quarter comprised 107 vessels of 1,047,743 deadweight tons while from the Pacific to the Atlantic 109 vessels of 1,036,744 tons deadweight departed, making a total number of sailings in the three months' business of 216 vessels and 2,084,487 tons deadweight.

Atlantic Coast Shipbuilders to Meet on May 14

THE annual meeting of the Atlantic Coast Shipbuilders' Association will be held in Philadelphia on Monday, May 14. This meeting, which will be attended by the executives from the shipyards and ship repair plants from all sections of the Atlantic and Gulf coasts, will be given over almost entirely to the serious problems confronting the shipbuilding industry.

It is known that several members have already found some very decided views on what should be done individually and collectively by the shipbuilders and others are requested to give immediate thought to the same subject.

Install Sperry Gyro-Compasses

Sperry gyro-compasses have recently been installed on Standard Oil Company of New Jersey tankers, *F. W. Weller*, *O. T. Waring* and *James McGee* and on the *Lillian Luckenbach* of the Luckenbach Line.

Annual Meeting of U. S. Chamber of Commerce in New York May 7-10

Transportation and European problems as they affect American business will be the general topics considered at the eleventh annual meeting of the Chamber of Commerce of the United States, which is to be held in New York, May 7 to 10. Grouped within the broader discussion will be a series of exchanges of views that should prove of real value to the forward looking men in the various lines of industry. A group session will be held for each cross-section of American business, including a foreign commerce group which will show the direct application of Europe's tangled affairs to American business.

British Shipping Exhibition

The annual British Shipping, Engineering and Machinery Exhibition will be held this year at Olympia, London, from August 31 to September 22.

TRADE PUBLICATIONS

DE LAVAL EQUIPMENT.—A manufacturing plant in which low pressure steam for process purposes is supplied from a turbine of special design is described in a profusely illustrated leaflet issued by the De Laval Steam Turbine Company, Trenton, N. J. This turbine operates automatically either as a straight condensing turbine, as a back pressure turbine, as a bleeder turbine, or as a mixed flow turbine or as a low pressure turbine, in such a manner as to maintain a balance between power requirements, low pressure steam requirements, hot water requirements, and the amount of power available from water power. This is accomplished by a third pressure controlled valve, in addition to the high pressure and low pressure valves ordinarily controlled by the steam governor in a mixed flow turbine. The utilization of exhaust steam for heating and process purposes, or the production of power as a by-product from steam used at low pressure, offers surprising economies, and this leaflet will therefore repay careful study by steam users in these times of high fuel costs.

PORTABLE TIMING DEVICE.—Accuracy of .1 in 60 seconds is attained in a portable timing device, described in Bulletin No. 46053, recently published by the General Electric Company. This device consists of an encased clock, to be used with a standardized clock as a means of secondary timing, to supplant the stop watch. The portable timing device has applications which enable its use with graphic instruments, measurements of angular velocities, and for indicating a definite time interval ranging from one second to any whole number of minutes. As illustrated in the Bulletin, the instrument consists of a clock, relays, and a gear train which by adjustment can be set to meet different demands of service. Power is supplied from a local flashlight type of battery. Errors as great as .4 second are frequently introduced through the use of stop watches, according to this Bulletin, which quotes from an article "The Limitations of Stop Watches," by A. L. Ellis. In addition to cutting the possibility of error down to .1 second, the portable timing device can be utilized for measurements ordinarily requiring a combination of instruments.

Coastwise Steamship Berkshire Launched

THE new coastwise steamship *Berkshire*, of the Merchants and Miners Transportation Company of Baltimore, was successfully launched at the yard of the Federal Shipbuilding Company on Saturday, March 17. The sponsor was Miss Mary Franklin Cromwell, daughter of Mr. W. K. Cromwell, of Baltimore, a director of the Merchants and Miners Transportation Company. The *Berkshire* is a sister ship of the *Alleghany*, which recently completed her sea trials and is about ready for delivery. Both

Contracts About to Be Awarded in Start of Norfolk Terminal Project Which Will Cost Several Millions

NORFOLK, VA. (Special)—Bids for bulkheading and dredging the Hardy tract on the inner harbor of Norfolk to pave the way for development of that 3,000-foot waterfront into a system of industries on the plan of the Bush terminal in New York, were opened this week and contract for the work will be awarded early next week, according to Colonel M. A. But-

ler, will be under construction in a short time and would be ready for business not later than January 1, 1924. He was not prepared to disclose the nature of the industries.

The entire project, which Colonel Butler said will eventually run into the millions, has been financed by a syndicate, of which George Norris, Philadelphia banker, is the principal member.

American Marine Association to Stage Spring Banquet at Waldorf-Astoria

THE American Marine Association will hold a spring get-together banquet at the Waldorf-Astoria Hotel, New York City, on the evening of May 3. Senator Royal S. Copeland, Captain William Stayton, president of the Baltimore Steamship Company; Mr. Joseph E. Sheedy, vice-president of the Emergency Fleet Corporation, and other prominent men in the marine field will deliver addresses at this gathering.

The American Marine Association, in addition to staging the annual Marine Exposition at the Grand Central Palace, is acting throughout the year as a chamber of commerce in the marine field. It is busily engaged in conjunction with the Department of Commerce and the Shipping Board in promoting standardization and simplification of shipbuilding and ship engineering parts, a movement which Secretary Hoover has successfully started in many other industries. The object of the banquet is to bring the maritime field together in closer contact and to develop suggestions that can be acted upon in building up our merchant marine.

Shipping Board Appoints Central Fleet Survey Committee

AFTER a conference with captains, naval architects and engineers, port engineers and caretakers of the laid-up fleet, the Shipping Board Committee on Survey, consisting of Vice-Chairman O'Connor and Commissioners Plummer and Benson, has appointed a central fleet survey committee to outline proceedings to be followed in making a complete survey of the Government-owned fleet. This committee consists of J. H. Philbin, manager of ship sales, chairman; J. E. Bailey, manager of the repair division at New York; James Swan, naval architect, division of ship sales, and A. Conti, consulting engineer, division of ship sales.

Upon the adoption of a plan of procedure the central fleet survey committee will act.

Double Acting Four Cycle Diesel Engines Ordered

BURMEISTER AND WAIN, LTD., of Copenhagen, Denmark, have received an order from the Swedish-American Line for two double acting, four cycle Diesel engines of 7,000 horsepower each to be installed in the company's new 560-foot passenger liner now building for the New York-Gothenberg service. Burmeister and Wain are now prepared to furnish this new type of engine in sizes ranging from 4,000 to 8,000 horsepower.

Charter Gas Engine Company Takes Over Mietz Oil Engine

THE Charter Gas Engine Company, Sterling, Ill., announces the purchase of the entire "MIETZ" oil engine (also known as "Mietz and Weiss") business, heretofore carried on at 128-138 Mott Street, and 430 East 19th Street, New York City, by the August Mietz Corporation and the Reliance Oil Engine Corporation. This effects a merger and consolidation, under one management, of two of the oldest internal combustion engines in the world.

New Merchants and Miners' Coastwise Liner Alleghany

ships will operate in the coastwise trade between Baltimore, Savannah and Jacksonville. These vessels have the following dimensions and characteristics:

Length overall	368 feet
Length between perpendiculars	350 feet
Beam, molded	52 feet
Displacement	7,000 tons
Passenger accommodations:	
First-class	205
Steerage	27
Speed at sea	12 knots
Engine	4 cylinder reciprocating
Boilers (four)	Scotch

These vessels have been designed particularly for comfortable travel at sea. Ample public spaces have been provided. Special features consist of many private baths with hot water connections; single berth rooms; facilities for handling all types of automobiles, including limousines and other types of closed cars; modern electric lifeboat handling devices, and many other features in add to the comfort and safety of the passengers.

It is hoped and expected that these vessels will be the forerunner of orders for additional ones from many other of the American coastwise companies, who really should begin to modernize their fleets, if they want to make them attractive to the traveling public.

Atlas-Imperial Engine Company Opens New York Office

The Atlas-Imperial Engine Company, of Oakland, Cal., builders of marine and stationary Diesel engines, announce the opening of offices and display rooms at 115 Broadway street, New York City.

New Ryerson Plant in Cincinnati

Joseph T. Ryerson & Son, Inc., Chicago, has purchased the plant, stock and goodwill of the Cincinnati Iron & Steel Company, Cincinnati, Ohio.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Overhauling, Newport News, Va.—The Norwegian steamship Romsdalshorn has been taken to Newport News for repairs.

Schooner Repairs, Norfolk, Va.—The schooner West Hardaway was towed to Norfolk for repairs to be made by Harriss, McGill & Company.

Gunboat Repairs, Charleston, W. Va.—The gunboat Wheeling, for some time stationed at Key West, has been taken to the Charleston Navy Yard for repairs.

Hull and Boiler Repairs, Mobile, Ala.—The tug Marion was placed on the docks of the Alabama Dry Dock & Shipbuilding Company for hull, boiler and several minor repairs.

Overhauling, San Francisco, Cal.—The ship Star of Lapland, of the Alaska Packers' Association, has been placed on the ways of the General Engineering Company for overhauling.

Steamer Reconditioning, Norfolk, Va.—The Old Dominion Transportation Company is reported to be expending approximately \$400,000 in reconditioning two steamers for passenger service.

Painting Steamer, Etc., Baltimore, Md.—The excursion steamer Charles Macalester was placed on Woodall's drydock, Baltimore, recently, for painting and preparing for the summer business on the Potomac.

Overhauling, Oakland, Cal.—The contract for generally overhauling and making interior changes in the Pacific mail steamer President Wilson was awarded to the Moore Shipbuilding Company, to cost \$9,528.

Contract Awarded, Kearny, N. J.—The contract for reconditioning the steamship West Africa, allocated to the Bull Lines, has been awarded to the Federal Shipbuilding Company. Estimated expenditure, \$45,000.

Restepping Mast, Chester, Pa.—The Sun Shipbuilding Company received the contract for restepping of the foremast of the Nawsco steamship Washash, carried away while lifting a heavy reel of wire rope. Approximate cost of repairs, \$15,000.

Overhauling Contracts, Oakland, Cal.—The schooner Thistle was placed on the Hanlon Dry Dock and Shipbuilding Company's ways for overhauling, and the Associated Oil Company's bay carrier Midway for overhauling and installation of a new capstan.

Miscellaneous Repairs, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company was awarded the work of docking the steamship Hugoton for examination, scraping and painting, drawing tail shaft for inspection and some boiler and machine work.

Overhauling, Baltimore, Md.—The steamer Emma Giles has been placed on the ways of the William E. Woodall & Company for overhauling for the summer Tolchester excursion season. The B. C. and A. steamer Joppa will follow her in dock for an overhauling.

Machinery and General Repairs, Mobile, Ala.—The Todd Shipyard and Dry Dock Company, Mobile, received the contract for making extensive machinery and general repairs to the Sinclair Oil Company's tank steamer W. L. Connelly. Approximate cost, \$40,000.

Extensive Repairs, Wilmington, N. C.—Diamond Steam Boat and Wrecking Company was awarded the contract to raise the sunken steamer Kingston, now resting in 30 feet of water in Cape Fear River. After being raised and securely fastened to barges she will be towed to the marine railway for extensive damage repairs.

General Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Company received the contract for overhauling, drydocking, cleaning, painting and performing general repairs on the E. R. Ritch & Company's tanker Broad Arrow. The bids were: Bethlehem, \$1,395; Moore's, \$1,285.

Steamer Reconditioning, Mobile, Ala.—The steamship Effingham has been placed on the docks of the Alabama Dry Dock & Shipbuilding Company to have her tail shaft drawn for inspection, cleaned and painted from keel to load line, to install zinc plates, renew rivets, and various other repairs.

General Repairs, Oakland, Cal.—The contract for general repairs to the United States Geodetic Survey steamer Discoverer has been awarded to the Hanlon Dry Dock and Shipbuilding Company. The following bids were submitted: Hanlon's, \$2,181; Moore's, \$2,243, and General Engineering, \$2,294.

Vessel Launched, Toledo, O.—The freighter Worrell Clarkson, building for the Kinsman Transit Company, Cleveland, was launched on March 17 by the Toledo Shipbuilding Company. The vessel is 600 feet overall length, 60 feet beam and 32 feet deep, and is to be delivered to her owners on April 15.

Launch Construction, Oakland, Cal.—The Crowley Launch Company, of San Francisco, has started the construction of four launch hulls, which will be equipped with 150-horsepower Diesel engines. The vessels will be sixty-four feet long, eighteen feet beam, and will have two fuel tanks for storage of 2,000 gallons.

Contract Awarded, Oakland, Cal.—The Moore Shipyard was awarded the contract for making changes in the Shipping Board steamer President Pierce. The following bids were received: Moore, \$9,854; General Engineering Company, \$12,340; United Engineering Company, \$12,472; and Bethlehem Shipbuilding Company, \$12,681.

Reconditioning, Baltimore, Md.—Steamers Santa Cecilia and Corvus, formerly of the Green Star Line and now of the Planet Steamship Corporation, have been awarded to the Maryland Dry Docks for reconditioning. The approximate expenditure for reconditioning the seven ships formerly of the Green Star Line will be \$100,000.

Low Bidder, Oakland, Cal.—The Crowley Shipyard was low bidder for general repairs to the steamer Susquehanna, work including voyage repairs, etc. Seven yards submitted tenders, which were: Crowley's, \$4,123; General Engineering, \$4,243; Bethlehem, \$4,828; Hanlon's, \$4,843; Moore's, \$4,882; United Engineering, \$5,385, and Main Iron Works, \$5,570.

Damage Repairs, Seattle, Wash.—The contract for making extensive repairs to the steamship Commercial Traveller, of the Moore & McCormick Steamship Company, of New York, has been awarded to the Todd Dry Docks, Inc., of Seattle. Twenty-five of the plates will be removed and replaced in addition to other repair work. Approximate expenditure, \$100,000.

Boiler Repairs, San Francisco, Cal.—The Crowley Shipyard was low bidder for making boiler repairs to the steamer Susquehanna. The following proposals were submitted: Crowley's, \$1,965; Smith & Scanlon, \$2,020; United Engineering, \$2,049; Bethlehem, \$2,270; Moore's, \$2,933; Hanlon's, \$2,940, and the General Engineering and Shipbuilding Company, \$2,949.

Diesel Engine Installation, Chester, Pa.—The Sun Shipbuilding Company, Chester, Pa., is installing Diesel engines in the following ships, recently bought from the Shipping Board: steel tanker Bidwell, 10,254 deadweight tons, 7,641 gross tons; steel tanker Miller County, 10,254 deadweight tons, 7,366 gross tons; and the steel cargo carrier Challenger, 11,850 deadweight tons, 7,955 gross tons.

Miscellaneous Repairs, Los Angeles, Cal.—The Los Angeles Shipbuilding and Dry Dock Corporation has been awarded the following contracts: Shipping Board tanker Tulsagas, machinery and hull repairs; Standard Oil tanker E. T. Bedford, machinery and hull repairs; Standard Oil tanker F. Q. Barstow, maintenance repairs; Standard Oil tanker Walter Jennings, extensive machinery and hull repairs; British tank steamer, the San Fraterno, drydocking and repairs.

Machinery Installation, Jacksonville, Fla.—Power suction pumps for use in supplying the dredges with boiler water are being installed on the U. S. E. D. tug Brannan, at the plant of Merrill-Stevens Company, Jacksonville. The machinery is intended primarily for use in operating the dredges in that district, but will also be adaptable for fire fighting. The intake suction pipe measures eight inches in diameter and there are several hose lines that can be played on flames.

Shipyard Work, West Coast.—The following contracts have been awarded to West Coast shipyards: Spreckles yacht Venitia and Mexican States Line steamer Colima to be drydocked for overhauling, cleaning and painting, to the Bethlehem Shipbuilding Corporation; steamer W. R. Chamberlin, Jr. installation of new booms and self-discharging and loading gear, to Hanlon Shipyards; and the cutter Pioneer and transport Buford for reconditioning, to the Moore Shipbuilding Company.

Reconditioning of Vessels, Oakland, Cal.—The Moore Shipbuilding Company will carry out reconditioning and repairs costing \$200,000 on the steamers Lake Frances and Lake Cayuga, recently purchased from the Shipping Board. The changes will include the installation of four masts, eight new booms, new winches, changing the fuel system from coal to oil, placing of new steel guards on vessels and other work. They will have an average speed of 10.05 knots and will be used as lumber carriers.

Ferry Launched, Staten Island, N. Y.—The new Staten Island ferryboat W. R. Hearst was successfully launched at Staten Island on March 17. She is equipped with 2,200 horsepower General Electric turbine generator, supplying 2,300 volts to the two induction motors, which are connected to the propellers. These motors have two speeds, 2,100 horsepower, at 176 revolutions per minute, used for driving the ferry and 100 shaft horsepower at 12 revolutions per minute, used to turn over the bow propeller.

Conversion to Oil Burner, Weems, Va.—Harpheys Railway, Inc., has been awarded the contract for the installation of oil burners in the E. H. Hubbard, Jr., of the Taft Fish Company. It is understood that this vessel is the first fishing schooner of a total of between 75 and 100 of such craft in the vicinity of Chesapeake Bay which are likely to undergo similar reconditioning. The boats are about 140 feet long by 18 feet beam, the propelling machinery developing about 750 indicated horsepower with steam supplied by a single-ended Scotch boiler with three furnaces.

SHIPYARDS AND DRY DOCK

New Drydock, New Orleans, La.—The ninth of chain of shipyards, operated by the Todd Shipyard Corporation, will be established in New Orleans within a few months, according to General Manager M. F. Hart. This will be a shipbuilding drydock and repair plant, involving an investment of \$3,000,000.

Drydock Sold, Portland, Ore.—The 2,000-ton drydock operated by the Columbia River Drydock, Engineering & Construction Company, of Portland, Ore., has been sold to J. L. McLain and Otis Cutting, of Seattle. The operation of the dock in Lou-

ering and raising a hull, it being a one-section type, its controlled by compressed air.

Drydock Sale, Boston, Mass.—According to announcement by Sidney Henry, Director of Sales of the Emergency Fleet Corporation, the Atlantic Works, Boston, Mass., has bought the 6,000-ton steel floating drydock, built by the Ramberg Drydock & Repair Company, and the purchaser expects to tow the dock from Brooklyn to Boston within the next few weeks. The Shipping Board still has five drydocks for sale, including three 10,000-ton wood floating drydocks located in New York harbor; one 10,000-ton wood floating drydock located near Providence, R. I., and one 6,000-ton wood floating drydock located at Jacksonville, Fla.

PORT IMPROVEMENTS

Harbor Improvements, Port Stanley, Ont.—Harbor of Port Stanley is to be improved. \$100,000.

Grain Elevator, Port Arthur, Ont.—J. Richardson & Sons, Royal Bank Building, Toronto, plan concrete addition to grain elevators, Port Arthur. \$500,000.

Pier, Sheboygan, Wis.—A pier is planned with docking facilities, hoisting and unloading machinery, etc., on Lake Michigan near South 8th street. J. Steimle, city clerk.

Wharf and Terminals, Corpus Christi, Tex.—Plans are being prepared for a wharf and terminals along Corpus Christi Harbor. Price, \$4,000,000. Sands & Cummings, Houston, engineers.

Drydock Machinery, Esquimaux, B. C.—R. C. Desrochers, Secretary, Department of Public Works, Ottawa, Ont., received bids on March 15 (change of date) for machinery for drydock at Esquimaux.

Grain Elevator, Norfolk, Va.—Norfolk Port Commission is having plans prepared for a gallery addition to grain elevator, Hampton Roads; price \$180,000. Folwell & Ahlskog, Sewells Point, architects.

Dredging, Etc., Houston, Tex.—Anderson, Clayton & Company, Mason Building, is taking bids for dredging channel for 600-foot wharves, concrete warehouses, etc. Price, \$1,000,000. W. L. Clayton, manager.

Terminal, Los Angeles, Cal.—Outer Harbor, Dock and Wharf Company (Union Oil Company, controlling interests) plans terminal wharves, docks, etc., on harbor front at Los Angeles. Cost, several million dollars.

Grain Elevator, Ft. William, Ont.—The Western Terminal Elevator Company awarded a contract to Eagles Construction Company, Ft. William, for reinforced-concrete addition to elevator. Engineer's estimate, \$500,000.

Grain Elevators, Port Arthur, Ont.—Gillespie Grain Company, 187 Grain Exchange Annex, Winnipeg, Man., are having plans prepared to rebuild and extend reinforced-concrete grain elevators at Port Arthur. \$800,000.

Bulkhead, Wildwood, N. J.—R. H. Coney, 106 East Garfield street, Wildwood, received the contract for constructing a bulkhead and for sandfill improvements on beach front from Schellenger to Montgomery avenues. Price, \$41,478.

Grain Elevator, Port Arthur, Ont.—Saskatchewan Co-operative Elevator Company, Regina, Sask., is having plans prepared for a reinforced-concrete addition to the port grain elevator; \$500,000. C. D. Towe & Company, Whalen Building, engineers.

Contract Awarded, Baltimore, Md.—The contract for dredging and making fill at McComas street bulkhead, 1,300,000 cubic yards, was awarded to Sanford & Brooks, Commerce and Water streets, and Arundel Corporation, Fidelity Building. Price, \$304,000.

Woodpile Wharf, Wilmington, Cal.—Pacific Coast Box Company, Central Building, Los Angeles, has had plans prepared by A. C. Martin, architect, Higgins Building, Los Angeles, for a 900-foot woodpile wharf, this being part of a \$1,000,000 improvement plan.

Levees, Etc., Yuba City, Cal.—Reclamation District 1550 has had plans prepared for reconstructing levees, enlarging canals, etc. Price to exceed \$500,000. J. Crowley, California Fruit Building, Sacramento, Cal.

Wharf, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port

of New Orleans, Suite 200, New Court Building, on March 22, for furnishing, erecting and painting of steel framing required for wharf structure at Poland Street Landing.

Dock, Superior, Wis.—The Great Northern Railway, Railway Building, St. Paul, Minn., plans to rebuild No. 1 ore dock at Allouez Bay, plans calling for reconstruction of inner 188 pockets and increasing height of dock from 73 to 77 feet, timber construction; \$1,500,000. R. Rudd, president.

Ferry Landings, Toronto, Ont.—City and Board of Harbor Commissioners, Harbor Building, are planning new ferry landings at foot of York street and at Toronto Island, \$26,000 and \$38,000, respectively. R. C. Harris, city engineer. E. L. Cousins, Harbor Building, engineer of Harbor Board.

Improvements, Palo Alto, Cal.—Plans are being prepared for the development of Mayfield Slough, 42-acre site, roadway on levee to landing, \$5,550; timber quay wall, 500 feet long, \$8,214; dredging channels, \$2,600; grading and graveling landing, \$2,750; warehouse, \$5,400, etc. J. F. Byxbee, Jr., city engineer.

Contract Awarded, Dallas, Tex.—The Jones Hettelslar Construction Company, 706 Mutual Building, Kansas City, Mo., received the contract awarded by the Pearlstone Mill & Elevator Company, Hickory street, for a reinforced-concrete addition to grain elevator, 200,000 bushels capacity. Price \$60,000.

Pier Construction, Charleston, S. C.—Engineers are preparing plans and specifications for the construction of a pier, costing \$150,000, to be built on property now occupied by piers Nos. 1 and 2 of the Union wharf at the foot of Market street, due to a suggestion to the Port Utilities Commission by Mayor John P. Grace.

Contract Awarded, Vancouver, B. C.—The Dominion Construction Company, Ltd., 509 Richards street, Vancouver, was awarded the contract for constructing a 700,000 bushel grain elevator, concrete storage house, timber work house and wharf on Burrard Inlet, by E. A. Woodward, Grain Exchange, Winnipeg, Man. Price \$500,000.

GOVERNMENT WORK

Boilers, Florence, Ala.—U. S. Engineer plans to purchase and install four steam boilers.

Harbor Dredging, Claibourne, Md.—U. S. Engineer plans dredging in Claibourne Harbor.

Piling, Louisville, Ky.—U. S. Engineer plans to purchase steel sheet piling for Dam 44, Ohio River.

Lock Gates, Nashville, Tenn.—U. S. Engineer plans steel lock gates for Lock S, Cumberland River.

Excavation, Wilmington, Del.—U. S. Engineer, Wilmington, plans dredging in Chesapeake and Delaware Canal.

Lock Gates, Chattanooga, Tenn.—U. S. Engineer will purchase lock gates for Widows Bar Lock and Dam.

Dredging, New York, N. Y.—U. S. Engineer, 2nd District, plans dredging and rock removal in New York and New Jersey Channel.

Dredging, Rouge River, Mich.—U. S. Engineer Office, Detroit, Mich., received sealed proposals on March 17 for dredging in Rouge River, Mich.

Wharf, Norfolk, Va.—Specification 4777.—Bureau of Yards and Docks, Navy Department, Washington, D. C., will soon take bids for extension to Wharf C, Norfolk.

Barges, Nashville, Tenn.—Penn Bridge Company, Beaver Falls, Pa., received the contract for fourteen steel barges for U. S. Engineer Office, Nashville. Price, \$150,535.

Removing Wreck, Buffalo, N. Y.—Sealed proposals were received on March 10 for removing wreck of steamer Arizona from St. Lawrence River at Cape Vincent, N. Y.

Survey Boat, Jacksonville, Fla.—The Burger Boat Company, Manitowoc, Wis., was awarded the contract by U. S. Engineer, Jacksonville, for one motor survey boat. Price, \$4,925.

Gates, Cincinnati, O.—Sealed proposals were received on March 28 by U. S. Engineer, Cincinnati, for furnishing, delivering and erecting gates for Locks 36, 38 and 44, Ohio River.

Dredging, New Orleans, La.—U. S. Engineer Office, New Orleans, will receive sealed proposals until April 9 for dredging Intracoastal Waterway between Bayou Black and Bayou Terrebonne, La.

Acetylene Cylinders, Staten Island, N. Y.—Sealed proposals were received by Superintendent of Lighthouses, Staten Island, on March 29, for furnishing 450 seamless drawn steel acetylene cylinders.

Dredging, Galveston, Tex.—The contract for dredging channels at Brazos Island Harbor was awarded by the U. S. Engineer, Galveston, to J. Jacobson, 2217 Avenue C, Galveston. \$181,200.

Dredging, Galveston, Tex.—U. S. Engineer awarded the contract for dredging 30-foot project in Houston Ship Channel to United Dredging Company, 233 Broadway, New York City, at a price of \$350,000.

Dredging, Honolulu, H. T.—U. S. Engineer awarded the contract for dredging in Honolulu Harbor, 1,250,000 cubic yards excavation, to Hawaiian Dredging Company, 854 Kuhuhuana street. Price \$949,540.

Castings, Etc., Florence, Ala.—U. S. Engineer, Florence, awarded the contract for furnishing castings and other parts for regulating gates of Wilson Dam to Charles Ward Engineering Works, Charleston, W. Va. \$119,300.

Painting, Repairs, Etc., Staten Island, N. Y.—Sealed proposals were received by the Superintendent of Lighthouses, 3rd District, Staten Island, on March 26, for docking, cleaning, painting and repairing the lighthouse tender Spruce.

Tanks, Florence, Ala.—The contract for furnishing displacement tanks for regulating gates of Wilson Dam was awarded to J. S. Schofield, Hammond and Boundary streets, Macon, Ga., by U. S. Engineer, Florence. Price \$136,300.

Dredging Ladder, Cincinnati, O.—U. S. Engineer, Custom House, Cincinnati, awarded the contract for a dredging ladder for 24-inch pipe line dredge to J. and J. B. Millholland Company, 714 Fifth avenue, Pittsburgh, Pa. Price, \$35,497.

Contract Awarded, Huntington, W. Va.—U. S. Engineer, Huntington, awarded the contract for constructing and delivering three steel barges to Riter-Conley Manufacturing Company, Leedsdale street, Pittsburgh, Pa. Price \$32,190.

Dredging and Rock Removal, Tampa Harbor, Fla.—Sealed proposals will be received by U. S. Engineer Office, Jacksonville, Fla., until 12 M., April 3, 1923, for dredging and rock removal in Tampa Harbor, Fla. Further information on application.

Lock Construction, Newburg, Ind.—U. S. Engineer Office, P. O. Box 72, Louisville, Ky., will receive sealed proposals until 2:00 P. M., central time, April 10, 1923, for constructing Lock No. 47, Ohio River, at Newburg, Ind. Further information on application.

Dredging Pump, Jacksonville, Fla.—United States Engineer Office, Jacksonville, Fla., will receive sealed proposals until 12 M., April 20, 1923, for furnishing and delivering a dredging pump for the United States dredge Barnard. Further information on application.

Dredging and Rock Removal, East River, N. Y.—Sealed proposals will be received by U. S. Engineer Office, Room 710, Army Building, 39 Whitehall street, New York, N. Y., for dredging and rock removal in East River, N. Y. Further information on application.

Painting Piers, Hoboken, N. J.—Bids were received at the office of Commissioner T. V. O'Connor, United States Shipping Board, 45 Broadway, New York City, on March 23, for the work of painting portions of Piers 1, 2 and 3, Shipping Board Terminal, Hoboken, N. J.

Manila Rope, Memphis, Tenn.—Sealed proposals will be received by Mississippi River Commission, 1st and 2nd Districts, Custom House, Memphis, until 11 A. M., April 3, 1923, for furnishing and delivering approximately 103,000 pounds of Manila rope. Further information on application.

Galvanized Wire, Etc., Memphis, Tenn.—Proposals were received at the office of the Mississippi River Commission, 1st and 2nd District, Custom House, Memphis, on March 26, for furnishing and delivering 870,000 pounds of galvanized wire, wire strand, and staples, and 24,000 wire rope clips.

Steel Sheet Piling, Louisville, Ky.—Sealed proposals will be received by U. S. Engineer Office, P. O. Box 72, Louisville, Ky., until 2 P. M., cen-

tral time, April 5, 1923, for furnishing and delivering steel sheet piling for Dam No. 44, Ohio River. Further information on application.

Motor Dredge Tender, San Francisco, Cal.—Sealed proposals will be received at U. S. Engineer Office, San Francisco, until 11 A. M., April 6, 1923, for constructing, testing and delivering ready for operation, one 40-foot motor dredge tender complete. Further information on application.

Concrete Wharf, Etc., New Orleans, La.—Sealed proposals will be received by the Board of Commissioners of the Port of New Orleans at their office, Suite 200, New Court Building, until 3 P. M., April 5, 1923, for concrete wharf, chain walls and column footings for shed at Claiborne Avenue Landing.

Dredging, Norfolk, Va.—Specification 4771.—Bureau of Yards and Docks, Navy Department, Washington, D. C., awarded the contract for dredging approximately 14,000 cubic yards at Navy Yard, Norfolk, to Norfolk Dredging Company, Campostella Wharf. \$0.395 per cubic yard, scow measurement (30 days).

Lock Construction, Ohio River.—Sealed proposals will be received by U. S. Engineer Office, P. O. Box 72, Louisville, Ky., until 2:00 P. M., central time, April 10, 1923, for constructing Lock No. 47, Ohio River, at Newburg, Ind. Further information on application.

Dredging, Astoria, Ore.—Specification 4615.—Bureau of Yards and Docks, Navy Department, Washington, D. C., awarded the contract for 400,000 cubic yards of dredging at the Naval Submarine and Destroyer Base, Astoria, to Gilpin Construction Company, foot of Fourteenth street, Astoria; price, \$0.15 per cubic yard.

Contracts Awarded, Huntington, W. Va.—U. S. Engineer, Huntington, awarded the following contracts for lock operating machinery, etc., for Dam 30, Ohio River: H. P. Gazzam Machine Company, 3200 Penn avenue, Pittsburgh, Pa., Lot A, \$7,995; J. & B. Milholland Company, 714 Fifth avenue, Pittsburgh, Pa., Lot C, \$6,739. Lots B and D rejected.

Structural Metal for Locks, Etc., Vicksburg, Miss.—U. S. Engineer Office, Drawer 421, Vicksburg, will receive bids until noon, April 7, 1923, for furnishing and delivering about 467,000 pounds of structural metal for locks and dams Nos. 5 and 8, Ouachita River, La. and Ark., and for erecting four steel gates at No. 5 and modifying two steel lock gates at No. 8. Information on application.

Dredging, Etc., Philadelphia, Pa.—Specification 4738 A and B.—Bureau of Yards and Docks, Navy Department, Washington, D. C., awarded the contracts for dredging, filling, wood bulkhead and concrete drain at Philadelphia, to American Dredging Company, 308 Chestnut street, \$0.33 per cubic yard; and to McLean Contracting Company, 1415 Fidelity Building, Baltimore, Md. (item 4a), \$14.945.

NEW INCORPORATIONS

The Pocahontas Steamship Company, capital \$500,000, incorporated under Delaware laws.

The Malston Company, capital \$800,000, to operate boats, incorporated under Delaware laws.

Universal Steamship Corporation, of Dover, Del., chartered under Delaware laws, capital \$100,000.

The American Export Corporation, of Manhattan, has increased its capitalization from \$25,000 to \$100,000.

The Colombian Steamship Company, of Wilmington, Del., capital \$1,800,000, chartered under Delaware laws.

The Olympus Steamship Corporation, of Manhattan, capital \$10,000, chartered at Albany. Incorporators: W. S. Auld, J. J. Binder and S. Brander.

The Algerian-American Shipping Company, capital \$50,000, chartered at Albany. Incorporators: George H. Haynor, Jr., E. Jones, and W. D. Greenlees.

The Superior Transportation Company, of Manhattan, capital \$50,000, chartered at Albany, to engage in the navigation business. Incorporators: L. J. Lake, J. E. Lee and A. M. Hull.

The Planet Line, of Manhattan, capital \$50,000, to engage in ocean commerce, incorporated under

New York laws. Incorporators: E. E. Baldwin, F. V. Barnes and R. F. Weeks, attorneys.

Daniel Ripley & Company, capital \$100,000, steamship company operating mainly out of Gulf of Mexico ports. The company has moved its headquarters from Galveston to Houston, Tex., a branch office to be maintained at the former port. Walter Terry Smith is president of the new corporation.

John J. Lenahan, of Buffalo, has just become associated with the Cowles Towing Company of that city, and the company has been incorporated under the name of Cowles Towing Line, Inc., capital \$50,000. The new company will take over the steel and wooden tugs, derrick boats, lighters and wrecking equipment of the Cowles company, a property valuation of about \$150,000. The business will be expanded. Operations will be in Buffalo harbor.

FOREIGN ACTIVITIES

Contract for Steam Colliers.—A contract for two steam colliers for Messrs. France, Fenwick and Company, Ltd., of London, has been secured by Messrs. Vickers, Ltd., of Barrow. The ships are to be 280 feet in length and to have a speed of ten knots.

Passenger Ship Launched.—A finely modeled twin screw steel passenger steamer for the British India Steam Navigation Company, Ltd., has been launched by Swan, Hunter & Wigham Richardson from their Neptune Shipyard, Newcastle-on-Tyne. This vessel, which is 440 feet in length and 55 feet 6 inches in breadth, will be propelled by two four crank triple expansion engines balanced on the Yarrow Schlick & Tweedy system. Steam will be supplied by 8 boilers working under Howden's system of forced draft.

Wear Yards Get New Contracts.—Five new orders for vessels have been recently placed on this river. An 8,000-ton vessel goes to Messrs. W. Pickersgill & Sons, another 8,000-ton ship goes to Messrs. J. Priestman & Co., two 3,300-ton vessels to Sir J. Laing & Sons, and a self-trimming collier of 1,800 tons to Messrs. J. Crown & Sons. Contracts for 40 new vessels have been placed on the Wear during the past few months and practically every shipyard on the river has work in hand.

Moore Line Steamer Launched.—The Orangemoor, fourth of the large steamers to be constructed for the Moore Line by the Northumberland Shipbuilding Company, has been successfully launched at their plant at Howdon-on-Tyne. This vessel is of the shelter deck type and will have a carrying capacity of 9,000 tons deadweight. Her principal dimensions are: Length, 415 feet; breadth, 53 feet; and molded depth, 35 feet 6 inches. The propelling machinery consists of a triple expansion engine built by the North Eastern Marine Engineering Company, Ltd., having cylinders of 27, 45 and 75 inches diameter, and a stroke of 48 inches.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson,
U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York.
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City.
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United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York
President—E. A. Simmons.
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The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irving G. Keller.

Port of New York Authority

11 Broadway, New York.
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morrisson,
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

May, 1923

No. 5

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY

30 Church Street, New York

F. B. WEBSTER, Editor
H. H. BROWN, Managing Editor

J. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

Contributing Editors

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WE GUARANTEE that of this issue, 4,700 copies were printed; that of these copies 3,829 were mailed to regular paid subscribers, 230 were provided for counter and news company sales, 215 were mailed to advertisers, 167 were mailed to employees and correspondents and 259 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 24,300—an average of 4,860 copies a month.

MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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MARINE ENGINEERING AND SHIPPING AGE announces the removal of its office from the Woolworth Building to 30 Church Street, New York.

Economy and Efficiency

THIS issue of MARINE ENGINEERING AND SHIPPING AGE is devoted to economy and efficiency not only because a great opportunity for savings in the cost of operating our ships actually exists but also because there is no better way of convincing Congress and the people of the United States that a permanent and constructive shipping policy could be adopted than by the elimination of every practice that may be pointed out as wasteful.

When Mr. H. E. Brelsford, chief of the technical section of the Shipping Board, made the statement, in his address to the Propeller Club on April 19, that "marine engineering is twenty-five years behind stationary practice" he presented a serious indictment against the shipping industry. Whether or not he is correct as to the number of years, unfortunately it is only too true that we do not get anywhere near the efficiency in the engine rooms of our ships that is commonly attained in power plants ashore.

We all know this but what makes it so serious is the fact that, unlike a shore establishment, the cost of operating a ship per annum is far more than the total purchase price of

the vessel at the present market values. Mr. J. B. Smull, president of the Emergency Fleet Corporation, and one of our most expert ship operators, in his testimony before the House Committee on Appropriations in 1921 said that it had cost his firm \$48 per deadweight ton per year to operate cargo ships on very favorable trade routes, namely, from New York to Hull and from New York to Bristol.

On longer routes and with less efficient supervision this operating cost per annum might easily approach \$60 a deadweight ton; in fact, this is approximately the figure recorded in Professor Chapman's "Relative Economy of Steam and Motor Vessels" which appeared in our January issue. But what is more striking is the fact that after removing all fixed charges, the shipowner who purchases a vessel at \$30 a ton or less spends each year more than his original outlay for his ship on items, every one of which is directly influenced by economy and efficiency.

Such being the case, the natural question is why do not the shipowners modernize their methods and the equipment on their vessels? The answer to this, to a large extent, is the ultra-conservativeness of shipowners, which originated from the fact that reliability is far more important at sea than on shore.

We have no controversy with shipowners where reliability is concerned but there are many ways, and we say this with all due respect to shipowners who have been in the business for a long period of years, in which increased efficiency would also mean increased reliability. There are places where co-ordination would save large sums in one department even if they caused slight losses in another. The time has come when the successful shipowner must not be satisfied, as will be pointed out in an article appearing in the June issue of our magazine, with a ship that meets requirements; he must, in order to compete, be sure that his vessel *best* meets every condition in every department.

Trim the Insurance Costs

A DEFINITE percentage of the overhead may be reduced, if full care is given the details that enter into the cost of insurance. It is worth the effort. Bear in mind that the two fundamental considerations taken into account by underwriters are the record of the steamship line and the trade in which it is engaged. On this basis the insured may arrange his coverage advantageously and economically by watching the following arrangements: *Insure on an annual basis*, rather than by the trip. This will result in a saving of an average of twenty-five percent of the premium,

dependent upon the length of the voyage and the trade the vessel is engaged in. *Watch the values*; that is, the amounts insured. Why pay for more insurance than you could collect in event of loss? Take out only so much as represents the actual values. *Keep repairs up*. Thus losses are minimized; and, for that reason, your rating is improved with the underwriters and you will always receive the most advantageous rate quotations. *Maintain a good record as respects losses*. This is the most important thing of all. Good records mean low insurance rates. To this end experienced officers and crews should be employed and they should be kept strictly on the job. Every care should be exercised in loading and stowage. Do not allow trickery in log entries; underwriters have a way of discovering the falseness in ascribing the consequences of carelessness to "heavy weather." *Cheap insurance is false economy*. The claim-dodging underwriter and the insurer of questionable solvency are the worst possible dependencies.

What Else Can Be Done?

THE announcement of the administration plan to develop our merchant marine even if it becomes necessary for the Government to directly operate the ships ought to make it plain to the whole country and the world at large that the time for action has arrived. Ever since the armistice was signed, over five years ago, we have indulged in endless conferences which we must acknowledge have resulted in no settled policy that could command the enduring support of the nation.

We appear to be as much at sea as we were at the start. Our most prominent shipping men, while opposed to the principle of Government operation, can suggest no practical alternative that would be reasonably sure of attracting private capital into the shipping business. In the confusion of the moment, however, there is one fact that is clear and that is, that there can be no doubt but that Chairman Lasker himself regards Government ownership as "poison ivy in the garden of industry."

Therefore to understand the President's viewpoint it is necessary to emphasize the fact that we have been operating our Government owned vessels on a system that no sane business organization would consider for a moment. We refer to the "heads I win, tails you lose" MO4 agreement under which the Government not only pays all the expenses of operating the ships but commissions besides.

The President is not proposing to substitute Government for private ownership. There are practically no privately owned vessels in the foreign trade. What he is trying to do is to develop paying trade lines that would be attractive to private capital in place of the vicious system now in vogue which offers no inducement for the operators to purchase the vessels allocated to them.

With shipowners demanding a revision of the shipping laws and with Congress refusing to allow a constructive shipping bill to come to a vote, thereby throwing back on the Administration the responsibility for developing the merchant marine, what could a red blooded President do but let it be

known that the American flag will not be allowed to disappear from the seas?

If American interests will purchase and operate vessels, well and good, they will receive the co-operation of the Shipping Board; but, if not, the President is prepared to direct that trade routes be developed at whatever monetary loss is necessary. Probably, however, the losses would be less than under the present system.

We say this because we know that the Shipping Board has developed an organization that can and will tune up the engineering and maintenance of these vessels to a high efficiency. The opportunity for instituting great economy is there and will continue to be until advantage is taken of the methods common in land practice.

We believe, therefore, that with shipowners taking a stand that it is not practical for private interests to purchase vessels until the shipping laws are revised, trade has increased and a permanent Government policy adopted, the President is justified in dressing up the ships and consolidating them into shipping lines that will be attractive to private capital. His chief aim is to establish an American merchant marine, under private ownership, if possible; but, if not, under Government ownership as long as necessary.

New Passenger Motor Liners

THE number of orders that have been placed recently for large motor passenger liners has caused something of a sensation in European shipping circles. The United Steamship Company of New Zealand started the ball rolling with their 20,000-ton, 600-foot liner which is now making good headway on the Clyde, and in which four 3,250 brake horsepower Sulzer engines will be installed. The Rotterdam Lloyd followed with a 15,000-ton liner, 550 foot in length, in which two 3,500 brake horsepower Sulzer type motors will be fitted, the hull and engines to be built in Holland.

The Swedish-American Line then contracted for a 17,000-ton liner to be built by Armstrong Whitworth on the Tyne and equipped with two 6,750 brake horsepower Burmeister & Wain engines of an entirely new type. This is undoubtedly the most remarkable development since the first motorship was built. The power will be developed in six cylinders and the engines will be of the double-acting four-cycle design. Burmeister & Wain have always viewed the two-cycle type with disfavor and their solution of the problem of developing high powers is to retain the four-cycle principle but to make the engines double-acting. Needless to say, they have carried out a vast amount of experimental work before feeling that they are on sufficiently safe ground to proceed with the manufacture of an engine of such extremely large size.

British owners have just placed two orders with Harland & Wolff, for 17,000-ton motor liners, in which a somewhat unusual machinery arrangement will be adopted. There will be four engines of the standard four-cycle single-acting design, but the ship will be a twin screw vessel with two engines geared to each shaft.

It will thus be seen that the motor driven liner is making great headway in England and the development has certainly been more rapid than most people anticipated.

Lake Hull Insurance

IN anticipation of the new season on the Great Lakes there is much evidence of activity on the part of shipowners and operators, insurance men and industrialists generally. The capacity rush in steel and iron, together with the increased demand and hardening of prices for copper, mean a good business in the Lake ore-carrying trade. Grain should also move freely, and as the country's prosperity is near a peak-point there is likely to be a heavy movement in west-bound package freight. This insures activity for both hulls and cargoes, as a dull season entails the tying-up of vessels and a consequent heavy return-premium drain for lay-up returns. An increasing fleet is being developed for the carriage of automobiles from Detroit factories to the East. Lake hull underwriters have been in conference and have thoroughly discussed terms and conditions for the new season. It has been agreed to meet last year's basis, with the exception that no allowance be made for \$2,500 deductible average. As was done in the last lake season, all freighters under any flag will be written at not less than 3¾ percent, on a value of not less than \$70 per ton, and only under the American Lake Hull 1921 form. Any exceptions to these terms and conditions are to be referred to a special committee of five appointed for this purpose. It has also been agreed that where policies attach after August 1 and before October 1 an additional rate of ½ percent pro rata will be charged. For policies attaching after October 1 a pro rata of 1 percent additional is to be charged. The underwriters have also been studying the numerous constructive total losses on wooden hulls last fall, and it has been decided to support the efforts of the American Bureau of Shipping as regards improvement in these conditions this spring; and to this end no policies are to be issued on wooden vessels without the insertion of a warranty requiring the vessel's classification by the Bureau. The insurance companies fail to discern any prospect of a reduction in repair costs and replacement charges, in view of the steady mounting of prices for steel and labor.

Is the Brooklyn Navy Yard Efficient?

IF as we believe the *raison d'être* of a navy yard is to expeditiously and efficiently repair and condition naval vessels, then it would appear from the observation of several of the hundreds of men whose business, or hopes of getting business, on the *America* has taken them to the Brooklyn Navy Yard that the first class battleship *Arkansas* is practically awaiting her turn while the major part of the attention of the official naval staff is being devoted to a merchant vessel.

There is no question in regard to the efficiency of the naval officers. They are fully competent to handle most any engineering job but if their attention must be divided between reconditioning an ocean liner and a battleship—the most intricate machine in the world—one or the other is bound to suffer.

We understand that no proportion of the fixed charges on the taxpayer's investment in navy yards is included in the estimates submitted on merchant repair work but what about

the pay of the supervisory force in charge of such work? Is not the pay of naval officers provided for in an annual appropriation? If such is the case, and the navy yards intend to solicit outside work, is there any good reason why this appropriation should not be cut according to the proportion of such work obtained?

Due to the indifference and ultra pacific tendencies of the people in the interior, it is going to be a difficult matter to secure from Congress sufficient appropriations for the Navy or the merchant marine. Why make it still harder by giving some of our "hard boiled" Solons an opportunity to point out that a navy yard engaged in extensive reconditioning work ought to be able to pay its own way just the same as private shipyards.

More than this the employment of a large number of men in a navy yard on merchant work is apt to cause suspicion that there is a vote-getting object in view. The Navy Department will find out, if it continues to compete with private yards for reconditioning jobs, that Congress will surely estimate the value of such work in determining future appropriations.

A Change of Attitude

THAT the conservative attitude of American shipowners toward the adoption of the motorship is changing to one of approval and even of enthusiastic support is becoming apparent as the results obtained with this type of propulsion abroad and the attitude of foreign shipowners are becoming better known to American engineers by personal investigation and observation. This change of viewpoint is shown by the recent statements of Mr. A. S. Hebble, superintending engineer of the Southern Pacific Lines, upon his return from an extended visit to the largest manufacturers of Diesel engines in Great Britain and Europe. Not only was Mr. Hebble very favorably impressed with the progress that has been made in the development of Diesel engines abroad but he has expressed the opinion that the motorship has a marked advantage over the steamship and that it offers great possibilities for the American shipowner to compete in world trade.

For the shipowner who is not favored with a supply of cheap fuel and has to buy fuel in the open market, Mr. Hebble believes that the motorship will prove the most economical, particularly in the transatlantic and transpacific trades and in service between the United States and South America. Regarding the adoption of this type of propulsion for passenger ships he heartily endorses the progressive policy of the shipowners abroad who have recently placed orders for five motor passenger liners varying from 15,000 to 20,000 each and declares that the Diesel engine is ideal for passenger liners up to 25,000 tons and of 18 knots' speed. Mr. Hebble has a word of caution, however, for those who have recently been impressed by the claims of Diesel engine manufacturers that the cheaper grades of crude oil or "boiler" oil can be used successfully as fuel in Diesel engines. While it is true that such fuel can be burned in most Diesel engines, the effect of this practice on the cylinder liners, pistons and valves, is more or less disastrous and the consensus of opinion abroad is apparently opposed to its use.

American Marine Standards Committee Meets

Method of Organization Adopted and Administrative Committees Appointed—Technical Supervisory and Sub-Committees Will Be Established to Recommend Standards for Hull, Engineering and Operating Details

IN order that the marine industries in the United States may benefit by the establishment of recognized standards for hull, engineering and operating details and thereby reduce the cost of ship construction and operation, so that competition with foreign shipping may be on more equal terms, the general committee on standardization, recently formed by the American Marine Association has adopted a plan of organization which will enable it to establish standards in the marine field comparable with the work of similar committees in other lines of engineering effort, both here and abroad, but entirely independent of them.

TO BE KNOWN AS AMERICAN MARINE STANDARDS COMMITTEE

At the third meeting of the general committee, which was held in New York on April 17 with Captain R. D. Gatewood, U. S. N., as acting chairman, it was resolved that the standardization and simplified practice project in the marine field be carried on under the name of the "American Marine Standards Committee."

The purpose of the American Marine Standards Committee is in line with the movement inaugurated by Secretary Hoover of the Department of Commerce for standardizing products and simplifying practice in the industries in order to eliminate waste and reduce costs. The extension of this work to the marine industries was proposed by Secretary Hoover at the annual Marine Exposition in New York last November and was taken up by the American Marine Association with the support of the Department of Commerce and the United States Shipping Board Emergency Fleet Corporation.

In order to carry out the work expeditiously and economically, the committee has adopted the plan of organization shown in the accompanying chart (Fig. 1). The American Marine Standards Committee will act as the executive committee, all details and correspondence being carried out through the office of its secretary in the Division of Simplified Practice of the Department of Commerce in Washington.

The work of the organization will be administered primarily by three committees as follows:

- A—Organization, membership and finance.
- B—Constitution and rules.
- C—Publicity and relations.

The policies of these committees will be carried out by the secretary.

ADMINISTRATIVE COMMITTEES APPOINTED

The following were appointed as members of the three administrative committees:

Committee A: Col. E. A. Simmons, president, American Marine Association, chairman; Capt. C. A. McAllister, vice president, American Bureau of Shipping, vice chairman; Charles F.

Bailey, engineering director, Newport News Shipbuilding and Dry Dock Company; Hugo P. Frear, naval architect, Bethlehem Shipbuilding Corporation, Ltd., and E. H. Rigg, naval architect, New York Shipbuilding Corporation.

Committee B: William F. Gibbs, president, Gibbs Bros., chairman; E. H. Rigg, naval architect, New York Shipbuilding Corporation, vice chairman; Capt. John F. Milliken, secretary, Neptune Association; John W. Gray, Newport News Shipbuilding and Dry Dock Company, and Capt. C. A. McAllister, vice president, American Bureau of Shipping.

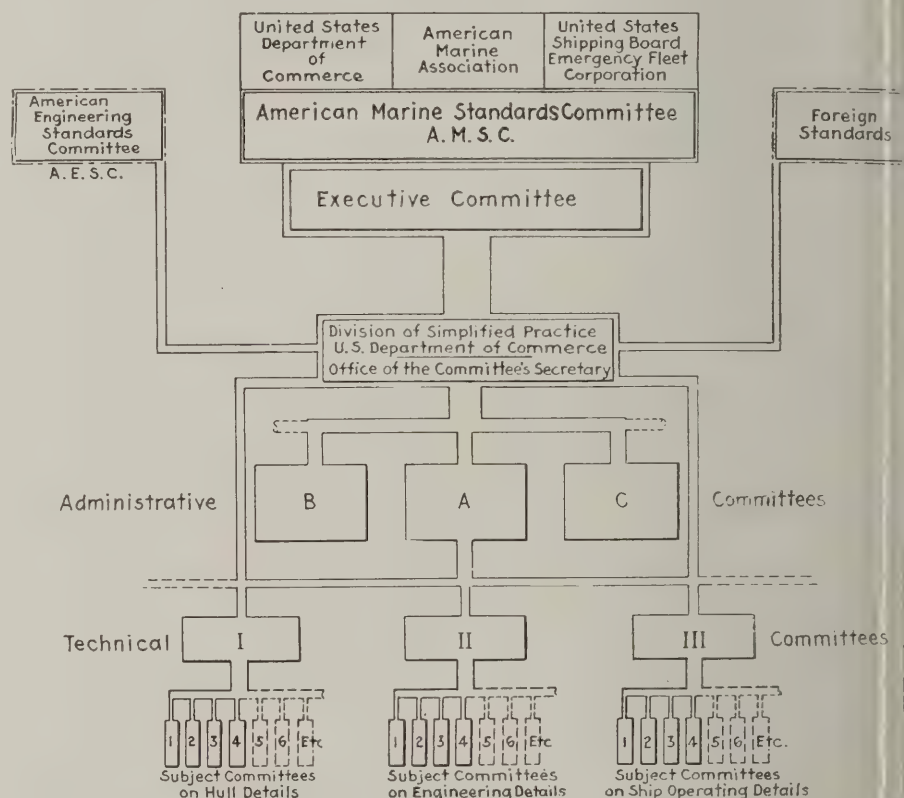


Fig. 1.—Chart Showing Organization of American Marine Standards Committee

Committee C: Capt. C. A. McAllister, vice president, American Bureau of Shipping, chairman; Capt. R. D. Gatewood, U. S. N., United States Shipping Board Emergency Fleet Corporation, vice chairman; Col. E. A. Simmons, president, American Marine Association; John W. Gray, Newport News Shipbuilding and Dry Dock Company, and Capt. John F. Milliken, secretary, Neptune Association.

TECHNICAL SUPERVISORY COMMITTEES

Through the committee on organization known as Committee A, three technical supervisory committees will be created as follows:

- I—Committee on Hull Details.
- II—Committee on Engineering Details.
- III—Committee on Ship Operating Details and Consumable Supplies.

Through each of these technical supervisory committees there will be formed a large number of subject committees which will be assigned the task of studying and formulating a standard for such specific items as will from time to time be designated by the executive committee, of which Mr. A. Bouillon has been appointed secretary.

The Government's Shipping Policy

American Merchant Marine Will Be Established and Maintained Even if the Government Is Forced to Operate the Ships

By Harold F. Lane*

WHETHER government operation of the ships, left on the government's hands as a heritage of the war, is to be the only policy which the administration at Washington will consider available as a result of the failure of the subsidy bill is still an open question. Both the President and the members of the Shipping Board are opposed to the adoption of such a policy, and have let it be known that such a course would be adopted only as a last resort. Further efforts are to be made to sell the ships but, if buyers do not come forward on terms regarded as acceptable by the board, it has been decided to go to direct government operation of the vessels for an indefinite period. Apparently neither the administration nor the board is very optimistic any longer as to the prospects of selling the ships on reasonable terms, and it has been decided that sales will not be made at "unjustifiable sacrifices." Chairman Lasker has also indicated that unless the shipowners and operators have been "bluffing" heretofore on the subject of the terms in which they would buy, he regards the chances of obtaining acceptable terms as rather slim. He also said he did not believe that they had been bluffing.

EXTENDED CONFERENCE HELD AT WHITE HOUSE

An extended conference on the subject was held by the President with the full membership of the Shipping Board at the White House on April 14, and a thorough discussion of the problems to be solved was had in the light of a report on the board's committee, which was making a special study of the questions of policy involved. After the conference it was announced in a White House statement that the board had unanimously agreed, with the President's concurrence, *"that the chief end to be sought is the establishment and maintenance of an American merchant marine,"* and that "with the failure of the subsidy act the board is confronted with the possession of a vast number of ships and the heavy losses under the existing plan of allocated operations under managing agents."

TO CONSOLIDATE FOREIGN TRADE LINES

In compliance with the shipping act, the statement concluded, the board will proceed at once to the consolidation of foreign trade lines, and then offer the sale of these lines and ships under the authorization of the law, conditional on a suitable guaranty of maintained service. "If such sales can not be made without unjustifiable sacrifice of the ships, then the government will proceed to direct government operation aggressively pursued. In short, there is unanimous agreement that the existing law contemplates and authorizes an adequate and maintained American merchant marine, and such a course will be followed as will fully guarantee it and contemplate its larger development." It is hoped that following the consolidation of the lines it will be possible to enter upon a sales campaign within 60 days.

WILL ASK CONGRESS TO AUTHORIZE NEW CONSTRUCTION

If continued government operation becomes inevitable, Congress will be asked at the next session to make an

appropriation not only to meet the annual deficit from operations but also to undertake a considerable expenditure for new ship construction to balance the present fleet. President Harding is proceeding on the assumption that in this way the responsibility for the future policy will be placed squarely upon Congress. If it is unwilling to appropriate enough to balance the fleet and maintain it there will be nothing else to do than to get out from under as speedily as possible. The losses of the Shipping Board from fleet operations have been reduced to about \$50,000,000 a year, as compared with about \$150,000,000 when the present board took charge. The number of managing agents was reduced, and their form of contract has been considerably revised, but, if it is found impossible to sell the ships, there will be a discontinuance of the managing agency agreements, which the board believes will still further reduce the losses.

During the month, while the President and Chairman Lasker were in Florida, the policy committee of the board, headed by Commissioner Meyer Lissner, has been giving close study to the problem of what should be done in connection with the government-owned ships, and conferences were held by the committee with representatives of the shipowners, the shipbuilding industry and the managing operators. The results of the conferences were later submitted to the entire board, and its views of the various perplexing problems that have arisen were laid before the President at the conference held within a week after his return to Washington from the South.

POSITION OF STEAMSHIP OWNERS

The position of the American Steamship Owners' Association was set forth in a letter from A. G. Smith, president, to Commissioner Lissner on March 26, after a conference with the committee of the association. The letter stated that the association regards it as fundamental that the Shipping Board and Emergency Fleet Corporation should retire from the business of operating ships and place the operation of the essential routes in the hands of private owners. The Shipping Board should immediately scrap such vessels as are inferior in design, equipment or condition, the association said, and it should offer its remaining vessels for sale to American citizens without restrictions and without discrimination between buyers.

SHIP OPERATORS' VIEW

A committee representing the United States Ship Operators' Association also conferred with the Shipping Board committee on March 28 to present the views of the managing agents who are operating government-owned vessels under what is known as the M O 4 agreement. They stated that those operating Shipping Board vessels are ambitious to become shipowners and look forward to the time when circumstances will permit them to purchase, but that they must face the economic fact that capital will not invest in ship securities until the profits are equal to and as reasonably sure as those in other lines of business. This committee was given to understand by the members of the Shipping Board that it was the intention of the board to discontinue the M O 4 system, apparently because there

*Washington correspondent.

is little stimulus under it for ambition to become a shipowner.

Another conference was held on March 29 with representatives of the shipbuilding industry. The shipbuilders expressed the opinion that only by giving preferential treatment to American shipping could it be made sufficiently attractive to warrant the expenditure of the considerable sum of money that would be required for the purchase and operation for a number of years of any large number of government ships. Homer L. Ferguson, president of the Newport News Shipbuilding and Dry Dock Company, advocated such matters as the bringing of the Philippine trade of the United States under the coastwise laws, reduced railroad rates on through shipments for export and import when carried on American flag ships and the abrogation of those portions of commercial treaties with foreign nations that prevent preferential treatment in tonnage taxes to American flag ships and preferential customs duties on imports in American vessels.

The Shipping Board had also issued a statement intended to make it clear that there is no prospect of Shipping Board ships being sold at less than world market prices for unrestricted service under any plan that the board has had under consideration. Studies had been made for offering ships on lines at a considerable reduction from world market prices in those cases where the purchasers will guarantee to maintain the services in foreign trade for a term of years, but it was stated that there was no intention of making reductions where there is no guarantee of the maintenance of the service to foreign ports and no reason at all why reductions should be made for the sale of vessels to be used in the protected coastwise trade, where foreign flag ships may not compete. The statement added that there was, therefore, no reason why shipowners should

hesitate to buy ships at the present time for unrestricted or coastwise or intercoastal operation because of any expectation that ships for such service would be sold at greatly reduced prices later on.

Leviathan Now Largest Ship in the World

THE *Leviathan* will start on her maiden voyage to Southampton and Cherbourg as a passenger ship under the American flag on July 4. This sailing of the largest most famous and most luxurious ship in the world on Independence Day is highly significant of America's determination, in spite of all handicaps, to develop a transatlantic service that will offer even better inducements in the way of luxury, convenience and comfort than can be obtained on any of the ships of our maritime rivals.

The *Leviathan* was the greatest and most famous of all transports during the war. She has taken nearly 13,000 troops at one sailing, which is by far the largest number ever carried by any ship. American workmen, engineers and architects have now made her the greatest of all passenger ships. Her gross tonnage is now 59,956 and she will carry 4,200 passengers in addition to a crew of 1,100.

The *Leviathan* is 950 feet 7 inches overall and 100 feet in breadth. The height from the bottom of her keel to the top of her smokestack is 184 feet. Steam will be generated in 46 express type watertube boilers which have been fitted to burn oil fuel. The propelling machinery consists of direct connected Parsons reaction turbines driving quadruple screws. The normal shaft horsepower is 66,000 which will develop a speed of 23 knots. However, the power plant is capable of turning out 100,000 shaft horsepower.



The *Leviathan*, the Largest Ship in the World, As She Will Look When She Sails From New York on July 4 on Her Maiden Voyage to Cherbourg and Southampton. The *Leviathan* Will Be Operated By The United States Lines and Will Be Commanded by Captain Herbert Hartley. She is 950 Feet Long with a Beam of 100 Feet and a Gross Tonnage of 59,956.

Situation Demands Reduction in Cost of Operation

Fuel Conservation Committee Setting Pace in Reducing Fuel Costs— Cooperation of All Departments Must Be Rigorously Carried Out

By "Old Scotch"

THERE are always two ways of doing things—hence for Americans to operate ships successfully, they must either get more revenue than they are now receiving, or else reduce the costs of operation which are now being paid. Perhaps a combination of the two will best fill the bill. From the present outlook, however, the chances of getting more revenue are not very propitious, if we may judge by the action of the senatorial heads of blocs, or block-heads, just as you may choose to consider them. As world conditions improve, as they eventually must, freight rates will undoubtedly pick up, but that is in the future, and money expected several months or years from now, does not pay crews nor keep the fires burning under the boilers right at his time.

There is one absolutely sure thing that we have to face, and that is that our shipowners must have their expenses of operation cut down at once, or there are going to be many more Yankee ships tied up to the wharves than there are at present. Tied-up ships mean idle crews, so it behooves everyone connected with ship operation to look at this situation seriously and begin economizing in the expenditures with which he is connected. The head of a household, when faced with domestic problems requiring retrenchment, is prone to begin cutting down his wife's allowance, while he goes merrily on smoking good cigars and patronizing bootleggers.

GREATEST SAVINGS POSSIBLE IN ENGINE DEPARTMENT

So each department of ship operation thinks that the other fellow should retrench and cut down his expenses, supinely copying the ostrich in that respect. The engine department controlling expenditures for fuel, lubricating oils, machinery repairs and engineer's supplies naturally is the greatest spender of money, and he who spends most is usually the one who should make the greatest savings.

The writer might modestly inject in the discussion at this point, that he is no new convert to economy in engine operation, as most of our readers will recall that he has been advocating reforms of this kind for over ten years in the columns of MARINE ENGINEERING AND SHIPPING AGE. He must also admit that during the past five or six years of profligacy in the operation of American ships, his advice has been little needed, as the waste which has taken place during this period of high returns from ocean freights has been most appalling. Within the past year the reformation has begun in earnest, and there are already indications of much better conditions.

FUEL CONSERVATION COMMITTEE

The United States Shipping Board, the largest single operator of ships in the world, has set the pace. This has been brought about largely through the influence of Vice-President Joseph E. Sheedy in charge of ship operations, who himself has been a sea-going engineer and knows intimately the

problems confronting the men on the ships. The organization of the Fuel Conservation Committee to take up the task of reducing the cost of oil and coal, the largest single expenditure connected with the ships, is directly due to Mr. Sheedy and this committee has shown results which amply warrant the prediction that its efforts will be crowned with success.

This effort was made none too soon, as since the committee began to function last August the contract costs of both fuel oil and coal have advanced nearly fifty percent. Through the hearty co-operation of the Bureau of Engineering of the

Navy the oil-burning school at the League Island Navy Yard, Philadelphia, has been made available for all American marine engineers, who may be sent there by the Fuel Conservation Committee. Its course of instruction is not confined to engineers on government owned ships, by any means, as all superintending and operating engineers who are American citizens are welcomed at this school of instruction.

Tangible evidences of the good which this school is accomplishing are getting more and more frequent. Fuel reductions of from ten to even thirty barrels of fuel oil per day are reported by the graduates of the school, and they give direct credit to the instruction which they received at League Island. The old idea that any one could burn oil efficiently under marine boilers is rapidly disappearing. The right methods are the only ones to use, and these can be obtained only from instructions by experts, who have made an intensive study of every phase of the art.

Such terms and abbreviations as viscosity, CO₂, Beaumé and B. T. U's now mean something finite in the minds of sea-going engineers who have received instructions laid down at the school, where heretofore they were largely dismissed from the thoughts of men actually in charge of firerooms as merely "highbrow stuff," which needed no attention from the "practical" man.

A knowledge of the proper "refractories" used for furnace linings, is productive of great economies both in amount of fuel used, and in voyage repairs. Heretofore marine engineers have been at the mercy of well meaning but ignorant brick-laying repair men, in selecting and applying proper refractory materials for the "ship's stomach." Both theoretical and practical instruction are given at the school to all students, and a few hours of close application under the direction of skilled instructors will make the ordinary marine engineer fully cognizant of the latest and best practices along that line.

ACCURATE PERFORMANCE RECORDS CALCULATED

In addition to the school, the technical staff working with the committee is busily engaged in collecting and analyzing data obtained from the logs of the operating vessels. The present fleet is divided into several distinct classes and types, such as the 535's, the 8,800-ton vessels, the Hog Island ships,

etc., which are grouped together and lend themselves quite readily to the tabulation of comparative performances. Standard fuel consumptions are assumed, which are readily obtainable on efficiently operated vessels, and comparisons are made on the basis of knots run per ton of fuel expended, the draft of water during each particular run being given due consideration.

On the best vessels of a type a number are showing efficiency ratings of over 100 percent, on the assumed basis. It is quite easy to pick out the "poor actors" when the type data is recorded on one sheet for all of the vessels coming under the particular category. There have been several vessels which showed as low as 65 percent efficiency, by this method of comparison, which otherwise would have been undetected except in the bills for fuel, which probably would have been accounted for by more or less general denomination of "bad actors" due to war construction.

PERSONAL INSTRUCTIONS GIVEN

In most instances of this kind special inspections are made of the personnel and machinery, and the principal faults quickly located. If bad performances have been due to inefficient personnel it is surprising how quickly results have been improved under instructions given by the special inspectors attached to the technical staff of the committee. Copies of all these relative performance sheets are placed in the hands of the chief engineers of all vessels in the list. This at once appeals to their pride of performance and due to the inherent human characteristic of rivalry, usually results in better performances in future runs. The whole tendency is towards improvement all along the line. If the best results are obtained by chief engineers who have attended the school of instruction, the less fortunate operating engineers immediately express a desire to have the benefits of the school given to them.

FURTHER LEAKS TO BE STOPPED

The committee realizes that its work has only just begun and is determined to investigate and make improvements in all the minor details of operation where losses of fuel can be checked. The proper setting of propeller pitches for the various types of vessels is being given intensive thought, so that this important matter will no longer be governed by the personal whims of would-be experts, as has been too often the case in the past.

Poorly constructed and inefficiently operated condensing apparatus is a fertile source of fuel loss, and will be taken up by the committee experts, as soon as conditions will permit. Inefficient and wasteful port operation of auxiliaries cause great losses of fuel, oftentimes on vessels which are very efficiently operated while underway at sea. Methods for minimizing these losses are now being studied, and remedial measures will be applied as rapidly as possible.

The committee has already prepared, and had posted in the engine rooms of all sea-going vessels, rules for the receiving and accounting for all quantities of fuel. This, together with greater care in the recording of expenditures at sea, will greatly aid the work of economizing, by providing more accurate data on which the results are recorded.

ALL DEPARTMENTS MUST COOPERATE

Summing up, the economizing of fuel is well started and good results may safely be predicted. But economies must be started and rigorously carried out in every other expenditure connected with ship operation. The deck department and the steward's department must lend a hand, and squeeze out every cent of unnecessary expenditure in every detail, no matter how comparatively insignificant they may appear. Ship repairs on American ships have been one of the greatest sources of waste, and, although considerable reductions have been made, there yet remain vast improvements to be accom-

plished. This subject will be given more intensive consideration by an expert in another article in a later issue.

AMERICA SHOULD LEAD IN NEW METHODS AND INVENTIONS

In addition to all these efforts towards economy, we must not forget that Americans have a habit of leading in new methods and inventions when they really put their brains to work in any great industry. Mark how easily the lead has been taken in the automotive industry when American capital and methods went at that game in an intensive way. In the ballad of the *Mary Gloster*, the dying shipowner probably best expressed the possibilities along that line of effort in the following verse:

I knew—I knew what was coming, when we bid on the
Byfleet's keel—

They piddled and piffled with iron. I'd given my orders for
steel!

Steel and the first expansions.

It paid, I tell you, it paid,

When we came with our nine knot freighters and collared the
long-run trade!

And they asked me how I did it, and I gave 'em the Scrip-
ture text,

You keep your light so shining

A little in front o' the next!

They copied all they could follow, but they couldn't copy
my mind,

And I left 'em sweating and stealing a year and a half
behind.

In the wild rush of creating our merchant marine fleet, all ideas of improvements over existing conditions were thrown ruthlessly aside in order to get out the ships in time for war demands. Now with plenty of time to devise new apparatus and methods we should be able to re-condition many of our existing ships and make them up to date in motive power and auxiliaries, so that as a whole they can be "a little in front o' the next," the "next" in this instance being the average ships of our competitors.

DIESEL-ELECTRIC DRIVE PROMISING

As new construction is demanded our best talents should be devoted to designing the most efficient ships afloat. While the Diesel engine is decidedly a foreign "step" ahead of us, and we have not kept up with their pace at all, the electric drive is distinctly American. The combination of Diesel generator and electric drive appears to be the most promising field of advancement in order to get ahead of the other fellow, and keep ahead of him. American design and methods of manufacture, if applied to this new field of propulsive power, ought to enable us to step out ahead of all competitors so far as fuel economy and operating efficiency are concerned.

IMPROVE CARGO HANDLING METHODS

American methods and ingenuity in handling cargoes is another direction wherein advancement can be made. The present cargo handling costs in American ports are far too excessive, while the methods used for handling cargoes on our own Great Lakes are not altogether applicable to cargoes handled along our seacoasts, there is still much that can be learned and adopted from our fresh water brethren, both in apparatus and systems employed.

We must not depend too largely on the mechanical means employed in shipping, as after all is said and done our success must be gained by the intelligent use of modern means. To that end a great deal of study and improvement must be made by the personnel in order to bring about the necessary advanced efficiency to enable us to hold our own in the fierce competition we must meet on the seas.

(Continued on page 262)

Economy in Steamship Operation and Management

**Aggregate of Losses Often Considered Trivial by Americans
Is Frequently Sufficient to Maintain Our Foreign Rivals**

By Robert F. Hand*

THE events which led to the defeat of the subsidy legislation clearly demonstrated that there can be no government relief for the shipping industry of this country until public opinion has been educated to the vital importance of a merchant marine. There is every indication that this will be a long and tedious process, while the recent decision of the Treasury Department that repairs made in foreign ports are subject to a 50 percent ad valorem duty renders the immediate situation more difficult and leaves little hope in the minds of men responsible for the operation of American ships.

However, our steamship owners are accustomed to discouragement and used to facing handicaps. They are already planning ways and means of meeting the situation and operating their vessels against the deadly competition of subsidized foreign tonnage.

It is evident that a solution can only be worked out through extraordinary efforts to increase the efficiency of management and operation with a resulting economy that will reduce our operating costs to a level close to that enjoyed by our foreign competitors. This is an ambitious program, but it has been said that the average American throws away enough to keep a foreigner, and there is no doubt that we have in the past been guilty of great extravagance in the operation of ships.

CONTACT WITH SHIPS' ENGINEERS ADVISED

This is particularly true in the Engineering Department. We have not given the operation of machinery the study and thought necessary to obtain the lowest possible operating costs, and we have also failed to establish close touch with our ships' engineers and encourage them to keep abreast of the latest and best engineering practice. In fact, we have been inclined to consider losses through faulty machinery operation too trivial for consideration, but we cannot neglect them henceforth, and it may be found that they represent a considerable part of the fuel bill.

Any economy in engineering must depend primarily upon close and intelligent supervision and this must be founded upon an adequate and well planned set of performance records in the central office, as it is only by this means that useful comparisons can be made and faulty operation readily detected. These records must be supported by careful observations and intelligent reports from the ships' personnel, and the American engineer is well qualified to handle this important phase of his duty if he is properly informed and the shore end of the work is well taken care of in competent hands.

SYSTEMATIC RECORDS WILL HELP

Many sources of economy will be uncovered by a close study of the engineering records of ships. A careful analysis of indicator cards and the temperatures and pressures carried throughout the plant, together with a careful check-up on the condition of auxiliary machinery will generally lead to considerable economy. It will also be found that a material saving will result from a special campaign against leaks

with a thorough study of the packing used throughout the plant, with a view of assuring the best possible selection of material in each case.

Large saving can be accomplished by organizing repair work on a periodical basis to fall concurrently with necessary boiler cleaning. This method offers the advantage of centralizing the work in those ports where the best supervision is obtained, and saves money by enabling contracts to be placed under competitive bids after specifications have been carefully prepared. A well worked out schedule for periodical repairs and boiler cleaning will, moreover, permit a thorough inspection system to be

The necessities of our present situation will demand a much more thorough investigation and study of combustion problems than has been accomplished in the past. Fuel oil combustion efficiency is seldom checked by scientific means, and there is no doubt that the present methods of oil burning, particularly in Scotch boilers, can be largely improved for economy. Steamship operators may find it advantageous to encourage wider interest in this important problem and to enlist the assistance of Government laboratories and test plants in experiments leading to greater economy in the burning of fuel oil.

established, which will in itself promote economy.

SUCCESSFUL COMPETITION REQUIRES QUICK TURN-AROUND

Both shore and ship organizations of American companies will have to be trained to appreciate the vital importance of rapid loading, discharging and dispatch if we are to compete successfully with foreign companies who are far ahead of us in turning vessels around in port. We have been inclined to attribute foreign superiority in this respect entirely to better dock facilities, but it will be found that the vital factors in quick turn-around are organization, co-operation and energy.

PURCHASE AND CARE OF STORES

Engine and deck stores offer a very profitable field for special efforts to attain economy, because American ships have been in the past extremely wasteful and unbusinesslike in their methods of handling stores. Great care should be used by all concerned with the ordering of material to assure that requisitions are reduced to the minimum requirements of necessity, and that specifications are carefully written in all cases so that the ship's storerooms are not cluttered with material for which there is no use, and which, besides representing a useless initial expense, involves a steady loss through rapid depreciation aboard ship.

Little attention has been paid in the past to the proper stowage and care of stores aboard ship. Mates and engineers who are responsible for storerooms should not only see that their material is properly stowed with every advantage for preservation, but should also keep a very careful check and

*Assistant Manager, Marine Department, Standard Oil Company of New Jersey.

inventory of stores on hand, for if this is not done waste and extravagance are bound to result.

When a large or even considerable fleet is operated, great economy will result from establishing a central warehouse from which all vessels are supplied. This not only offers the benefits of quantity purchasing and careful inspection of material, but presents the added advantage of permitting a close scrutiny of requisitions and the best possible assurance that excessive or uneconomical orders are not filled.

Steamship operators will find it economical to adopt a combined Specification and Stock Book which is a standardization of all stores and equipment required for the operation of the fleet. This book should indicate to all concerned what items are on the standard list of each department, and also furnish brief specifications for each item, sufficient to identify it and to assure that the article purchased and supplied is the identical article required.

Items for each department may be arranged in two general groups designated "Consumable" and "Equipment," the distinction being governed by the value of the individual item and the frequency with which it requires replacement. For convenient reference and record keeping the contents of each of the above groups should be subdivided according to their general character or use into a number of classes, briefly defined and listed under a classification index.

It is believed that this system of classifying and ordering stores will result in marked economy, and after it has been in operation for a considerable period in this form, the book may be made the basis of a ship's allowance system which will effect further economy and efficiency in storing vessels.

A happy ship is always an efficient ship and a crew is never content if the men are not well fed. Good feeding does not necessarily mean extravagant operation in the Steward's Department however. It is entirely possible to improve the quality of meals aboard ship and at the same time make large reductions in feeding costs. This is proven by the experience of our company, which reduced its feeding costs in half during the period from January, 1921, to the present time, and accomplished during the same period a marked improvement in the quality and service of food.

This gain in efficiency followed an intensive economy campaign in the hands of an energetic Supply Section head. The purchase of provisions was carefully organized to provide quality products at minimum prices and a very careful check, based on a standard feeding provision list, was made of stores used aboard ship. In addition close contact was established between the office and the personnel of the Steward's Department afloat, so that incapable men were gradually eliminated from the organization and the personnel were instructed and encouraged to make the efforts that produced better results with a saving of more than 50 percent in cost.

It must be realized that whatever measures are adopted, their ultimate success will depend upon the loyalty and ability with which they are supported by the ships' officers. Therefore, the most important phase of the work that American steamship operators have before them is the special effort that must be made to keep in close touch with the seagoing personnel in order to impress upon them the necessity of economy and to enlist their loyal co-operation in attaining it.

Situation Demands Reduction in Cost of Operation

(Continued from page 260)

Schools of instruction in all branches of ship operation should be started along similar lines to those employed at the fuel burning school in Philadelphia. Our deck officers need advanced training in their functions of handling and stowing cargoes and in conducting ship's business in foreign ports.

Already the officials of Columbia University are looking into this matter in connection with their summer courses in industrial training of all sorts. With a very little encouragement on the part of shipowners, such courses could be started and made of incalculable benefit to the advancement of our merchant marine aspirations. Knowledge of all the details of any business is, after all, the controlling factor in any business competition.

The deck and engineer officers in our merchant marine of

the future can no longer rest content with a superficial knowledge of the rudiments of their profession. It is the special knowledge of all the ramifications of their jobs which will enable them to obtain and retain employment. The ship owners' interests must be studied in every way, for if it is not profitable for Americans to operate our ships, none will be operated, and the thousands of really good men who are now earning their livelihoods from following the sea, will have to seek employment in other industries.

Everyone connected with American shipping must go into this contest in spirit as well as in work. We must have faith in our own efforts, for without faith and a spirit to conquer what seems overwhelming obstacles, we will meet defeat. It is not true Americanism to give up a task which seems insurmountable. If our forefathers had not the spirit to win, we would today be a dependent colony, and not the leading nation of the world.

Up and at it!

Ship Repairs Represent 13 Percent of Operating Costs—How Can This Item Be Reduced?

CAPTAIN R. D. GATEWOOD, Director of Maintenance and Repair, United States Shipping Board, suggests that a solution for this problem lies in creating a high morale among the crew, in closely checking the method of awarding repair contracts, in knowing the cost of repairs and in having an efficient port staff. He has written a special article for the June issue of MARINE ENGINEERING AND SHIPPING AGE "Efficient Repair Methods Adopted by the Shipping Board," in which he outlines what the Board has done to reduce repair costs.

In an article on "Economy in Ship Repairs" which will appear in the same issue, Robert W. Morrell, M.E., Marine Superintendent of the Tidewater Oil Company, outlines the maintenance problem confronting the independent operator. Mr. Morrell treats the subject of repair economy in its proper relation to the general scheme of successful steamship operation.



Towing Model in Experimental Tank at Washington Navy Yard

Savings Possible With Properly Designed Propellers

Considerations Affecting Propeller Efficiency—Smooth Blades Cut Down Ship's Operating Costs 3 Percent—Wake Gain and Thrust Deduction

By Rear-Admiral D. W. Taylor, U. S. N. (Retired)*

POSSIBLE propeller efficiency depends primarily not so much upon the propeller itself as upon the combination of power absorbed, speed and revolutions for which the propeller must be designed. There is one other feature, however, which should always be given great weight, although the eternal compromise here must be between first cost and economy in service. I refer to the material used for blades. If this is an alloy which can be made very smooth in the first place and retains its smoothness fairly well between dockings, there will be great economy over cast iron or cast steel.

A paper by McEntee in 1916, before the Society of Naval Architects and Marine Engineers, is very significant in this connection. He tested four 16-inch propellers: Two of bronze, one of cast iron and one of cast steel. One bronze propeller was polished all over; the other three, all cast in the same mold, were tested as cast. The smooth propeller showed a maximum efficiency of 72 percent; the other three ran very close together, their maximum efficiency averaging 63 percent.

SMOOTH PROPELLER BLADES SAVE 3 PERCENT OF SHIP'S OPERATING COST

In service, after a certain amount of corrosion and pitting on blades subject to it, it seems altogether likely that the above loss of 12½ percent would be increased as compared with smooth blades. The first cost of the latter blades will, of course, be greater, but if the cost of fuel used for propulsion is, say, 25 percent of operating expenses, and we save

12½ percent by the smooth blades, this saving will amount to some 3 percent of operating cost, and it will be nearly all net saving.

While considering this question of propeller friction, attention may be invited to the great loss of efficiency when propeller blades happen to harbor marine growth. This is more common with naval vessels, liable to make long stays in harbors where fouling is rapid, than with merchant vessels, but it is obvious from the experimental results quoted above that a very moderate fouling, hardly perceptible to the eye, will cause a notable loss of efficiency. McEntee investigated this matter also, and found that a very foul propeller might show an efficiency only 50 percent of one with smooth blades. The propeller blades on merchant vessels can hardly be cleaned by divers, as is frequently done on naval vessels, but, if some one will discover a suitable propeller blade material that not only does not corrode but does not foul, he would confer a boon upon owners of shipping.

While there is, of course, for every type of propeller one best design to meet a given set of conditions, it is possible to design any number of different propellers whose falling off of efficiency below the maximum possible is so small that no one would detect the difference in service. This is no doubt the reason for the prevalent belief that it is very hard to design an inefficient propeller. Nevertheless, it can be done, and when we consider our lack of information as to the actual conditions under which propellers operate, it is remarkable that it is not done more frequently.

As the result of hundreds of tests of model propellers the

*Former Chief Constructor, United State Navy.

results of which have been made public, we are in a position to determine very satisfactorily a propeller that would drive a phantom ship—a ship that would show the resistance of the actual ship but would not disturb the water in any way. When, however, we consider the combination of actual ship and propeller, we at once get into trouble. The ship interferes with the propeller, so that the latter is usually essentially less efficient than if the ship were not there.

WAKE GAIN

This is not a large loss, however. A propeller, particularly that of a single-screw vessel, is working in a current—nearly always a following current or wake—caused by the frictional drag and the streamline and wave disturbances of the ship. This affords a possible gain of efficiency, if we can design our propeller to take advantage of it, but it seriously modifies the propeller design. Consider, for instance, a propeller to absorb 1,000 shaft horsepower on a single-screw 10-knot vessel. If the wake is equivalent to a uniform following current having 25 percent of the speed of the ship (by no means an excessive amount), the speed of advance of the propeller with reference to the water in which it works is not 10 knots but $7\frac{1}{2}$ knots, requiring a larger propeller and a finer pitch than if the speed of advance were 10 knots.

THRUST DEDUCTION

Unfortunately, also, there is a third factor wherein the actual ship differs from the phantom ship. The propeller cannot develop thrust without developing a certain amount of suction upon the after part of the vessel, thus increasing its resistance. We usually express this as a percentage of the gross thrust. This loss, on the average, is not far from the gain from the wake. The hull efficiency, as it is called, being the resultant of the wake gain and the thrust deduction, is usually somewhere near unity—seldom as much as 10 percent below or much more than 10 percent above. Both the thrust deduction and the wake vary with the characteristics of the vessel and the propeller size and location, and the only method known at present of approximating to them with good accuracy is that of an experimental investigation using models of hull and propeller.

In fixing upon the power for a ship, in case we have no line upon these factors of thrust deduction and wake, we can assume that they neutralize one another, or make a small allowance as a factor of uncertainty, but when it comes to designing a propeller we cannot do this. A positive wake necessitates a larger propeller than if there were no wake, and the thrust deduction, meaning more power so far as the propeller is concerned, also requires an enlargement of the propeller if we are not to lose efficiency from excessive slip. Hence, as to the propeller, these factors do not neutralize, but reinforce each other.

In practice, the increase in power necessitated by the thrust deduction is usually taken care of in the estimate of the power which must be delivered to the propeller. Assuming the power of the propeller determined accurately, if we knew the wake fraction, or ratio between the speed of the following wake and the speed of the vessel, we could design our propeller as accurately as for the phantom ship. Unfortunately, during the forty years since R. E. Froude's masterly paper of 1883, which for the first time, I believe, brought to the attention of naval designers these factors of wake and thrust deduction, experimental investigation has not enabled us to predict accurately the wake which a given screw in a given location with reference to a given hull will experience. However, the model basins of the world are going more and more into this matter. The last meeting of the Society of Naval Architects and Marine Engineers had a notable contribution on the subject from Professor Bragg of the University of Michigan, and there is little doubt that our

present uncertainties in this connection will be resolved in a comparatively short time.

Fortunately, however, we can get along fairly well without exact knowledge of the wake factor. The important thing is to recognize the fact of its existence and not proceed with the design of propellers from model experiments as if our ships were phantom ships. This would result in propellers being too small, and the easiest way to spoil a propeller is to make it too small. Nearly fifty years ago the famous *Iris* showed that the propellers as fitted on that British man-of-war were too large, but times have changed and few of us nowadays have ever encountered a propeller that was too large.

HOW TO DETERMINE WAKE FRACTION

In order to design intelligently from the point of view of efficiency, making use of the enormous amount of experimental investigation of propellers that has been published, it is necessary to determine somehow the wake fraction to be allowed. Many designers do this by indirect methods. The best plan is to determine the wake fraction by experiment with a model of the actual ship, and the next best is to deduce it from analysis of an accurate trial of a ship closely resembling the one we are considering, with propeller similarly located. The latter requirement is very important, if we aim at minute accuracy. However, these methods are practicable in comparatively few cases. In 1910 I suggested the roughly approximate formulæ given below:

If w denote the wake fraction,
 V the speed of the vessel,
 V_A the speed of advance of the propeller,
 and b the block coefficient of the vessel,
 then speed of wake $= wV$
 $V_A = V(1-w)$
 $w = -.05 + .5b$ for single-screw vessels,
 $w = -.20 + .55b$ for twin-screw vessels.

The above are based upon investigations published by W. J. Luke in 1910. The latest investigations indicate that the single-screw formula above is liable to give values to w a little high, and that the prismatic or longitudinal coefficient is a little better primary variable from a scientific point of view than the block coefficient. But taking ships as they are, until we are able to devise formulæ taking account not only of the fullness of the vessel but of the size and position of the propeller, the above roughly approximate formulæ are near enough for the purpose of propeller design when the first and second methods referred to above are unavailable. Probably, on the average, we will come a little closer to the single-screw wakes by using

$$w = -.10 + .5b$$

In any case, we will find large wakes for full, low-speed ships. Failure to realize the fact that these large wakes actually exist is liable to deceive us as to the efficiencies we are getting out of propellers. If the propeller of a single-screw ship shows in service an apparent slip of, say, 10 percent, we are apt to regard it as good. But suppose a 10-knot ship with a 25 percent wake shows an apparent slip of 10 percent. The speed of the propeller is $10/.9 = 11.11$ knots. Then the apparent speed of slip is 1.11 knots. Adding the 2.5 knots of the wake, the true speed of slip is 3.61 knots, corresponding to a true slip of 0.325. In other words, the screw is working with a slip, not of 10 percent, but of $32\frac{1}{2}$ percent and any screw working with a real slip of $32\frac{1}{2}$ percent is wasting a lot of power.

IMPORTANCE OF REVOLUTIONS ON PROPELLER EFFICIENCY

There is one more or less controllable factor which has a major influence upon the possible efficiency of a screw propeller; that is the revolutions per minute. To survey this question, the results of systematic experiments with small propellers are of great value.

Fig. 1 shows in a boiled-down form the limitations of a family of three-bladed propellers, all of the same blade width and the same root thickness of blade and covering the practicable range of varying pitch ratios. It is adapted from Fig. 212 of "Speed and Power."

If P denote the shaft horsepower, or power absorbed by the propeller,
 VA its speed of advance,
 R its revolutions per minute,
and d its diameter in feet,

then, assuming Froud's law of comparison, we can deduce two dimensionless characteristics, as below:

Revolution characteristic = $C_R = R \sqrt{\frac{P}{VA^5}}$

Diameter characteristic = $C_d = d \sqrt{\frac{VA^3}{P}}$

These characteristics are independent of size, so from the results of experiments with the model propeller we can determine R , P and VA and, hence, C_R and C_d , for any slip.

The curve for maximum efficiency is simply a line drawn tangent to the successive curves of efficiency for varying pitch ratios, all plotted on the C_R base, and the C_d line giving diameter characteristics for the maximum efficiency is simply a line joining the corresponding values of C_d . Of

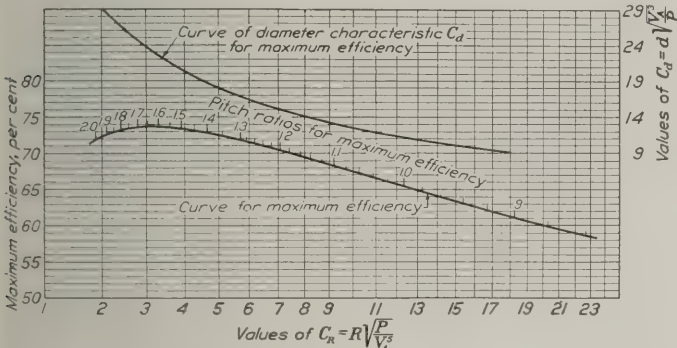


Fig. 1.—Relation Between Power, Revolutions, Speed of Advance of Propeller Through Water and Maximum Efficiency Possible for Propellers of Average Blade Width ¼ the Diameter and Maximum Blade Thickness 1/20 the Diameter

course the curves of Fig. 1 would be different for other blade widths and blade thicknesses, but these have comparatively small effect, the former in particular having much less influence than is usually ascribed to it. And, as a matter of fact, the efficiency of the propeller type to which Fig. 1 refers is about the best obtainable with propellers of uniform pitch and ogival blade section. The point is that the particular features of the curves of Fig. 1 are the same as any other family of propellers would show. Hence with fixed R , P and VA we fix C_R , and hence the maximum efficiency obtainable. We may easily choose a diameter and pitch ratio that will absorb the power with a smaller efficiency, but nothing we can do as to diameter and pitch ratio will give us a greater efficiency.

The outstanding feature of Fig. 1 for present purposes is that for values of C_R found in practice the maximum propeller efficiency possible falls off steadily with increase of C_R . When C_R equals 3.5, the propeller efficiency, then at an absolute maximum, may be 73.5 percent or 74 percent. Double C_R and make it 7, and we have lost some 3 points of efficiency, our new possible efficiency being 70 percent. Again double C_R , making it 14, and our possible efficiency drops to a little over 64 percent, that is, 9½ points below the efficiency possible when C_R equals 3.5. This is a loss of about 13 percent based on the absolute maximum of 73.5.

Now the only controllable factor subject to material vari-

ation which enters into C_R is R , the revolutions of the propeller. Hence, unless we increase the number of screws, the only way to keep C_R down is to keep the revolutions down. Unfortunately about every other factor in the situation impels us to keep the revolutions high. With high revolutions the propeller is smaller, while the engines are smaller, lighter and cheaper, and, frequently, as in turbine drive, more economical. Compromise between the conflicting considerations is necessary, but it should be made with full knowledge of what we are doing. For instance, by adopting high revolutions we may lose 5 percent of propeller economy. If we gain 5 percent of fuel economy, there is no net loss in operation, and we have a cheaper and lighter engine. If we gain no fuel economy, we have a net loss in operation of 5 percent of fuel cost, and it is hardly likely any saving of first cost would offset this perennial drain from fuel loss.

DIFFICULTIES INVOLVED IN DESIGN OF PROPELLER FOR
LARGE LOW-SPEED VESSEL

Table I illustrates the difficulties confronting the propeller designer in the case of large low-speed vessels. Vessel No. 1 is a 10,000-ton deadweight tanker, which on trial, loaded, showed a maximum speed of 12 knots. As far as propeller design is concerned, however, the diameter and pitch in Table I would have been the same for 10 knots, or any other speed lower than 12 knots, provided always the variation of the power was as the cube of the speed throughout the range of speeds considered.

This is very closely true in this case, from 10 to 12 knots. We see from Table I, in the first column, that vessel No. 1 cannot avoid a rather low propeller efficiency. The revolution characteristic, in fact, was so high that the diameter characteristic had to be arrived at by extending the curve of Fig. 1.

The second column shows what could be done, if, by enlarging the cylinder diameters or length of stroke, we develop the same power at 60 revolutions. If we enlarge the propeller to about 21½ feet, which is practicable for the draft of water, we would increase the possible propeller efficiency to 0.63 a gain of about 7 percent over the 0.56 value. As a matter of fact, the gain would be slightly greater, and the diameter would not increase as much as indicated in the second column of Table I.

Table I.—Applications to Fig. 1

Conditions actual or assumed	Vessel No. 1		Vessel No. 2	
	As Tried	Assumed Reduced Revolutions	Twin Screw Actual	Single Screw Assumed
Speed of vessels in knots.....(V)	12	12	12.5	12.5
Revolutions per minute.....(R)	83.5	60	115	115
Shaft horsepower.....(P)	2,852	2,852	1,700	3,400
Block coefficient.....	0.801	0.801	0.75	0.75
Estimated wake fraction.....	0.30	0.30	0.20	0.20
Speed of advance .....(VA)	8.4	8.4	10	10
$R \sqrt{\frac{P}{VA^5}}$ (C_R)	21.8	15.6	15.0	27.8
Maximum propeller efficiency (Fig. 1)	0.59	0.63	0.634	0.56 about
C_d for same (Fig. 1)	8.13	9.80	10.03	
Pitch ratio for same..... (Fig. 1)	0.87	0.94	0.95	
$d \sqrt{\frac{VA^3}{P}}$	2.19	2.19	1.30	
Propeller diameter from above.....	17.5	21.6	13.0	
Pitch ratio from above.....	15.2	20.3	12.4	

This gives us only a first approximation. For a second approximation we would make P only 0.93 of 2,852, and C_R would be reduced to a little over 15. Vessel No. 1 actually had a four-bladed propeller of a type slightly different from the type of three-bladed propeller to which Fig. 1 applies, but the effect of change of revolutions upon effi-

ciency would be substantially the same. The apparent slip on trial was about 5 percent only, but for a wake fraction of 0.30 the actual slip would be 0.34, a different thing.

Vessel No. 2 is a large twin-screw motorship. With increasing confidence in oil engines, there is a desire to fit single screws instead of twin screws on motorships. Table I shows that in this case there would be a very serious loss of efficiency by doing this.

The cases in Table I are fairly typical, and the large low-speed cargo vessel is usually fated from the first to have a low propeller efficiency. One line of amelioration would be the adoption of a type of propeller adapted to give a higher efficiency at large values of CR than the standard type to which Fig. 1 refers. I believe a thorough investigation would show a possible gain of at least 5 percent for CR values of 20 or thereabouts. Even so, the efficiency would be less for large than for small values of CR , and lower revolutions would always result in a gain in propeller efficiency.

In the above, I have taken no account of cavitation. That is a special trouble where the law of comparison upon which Fig. 1 is based fails because the motion around the full-sized propeller differs from that around the model. Fortunately, for vessels where economy is a prime consideration, the conditions are seldom such as to involve danger of cavitation. This is a trouble of the extremely high-speed vessel.

THREE-BLADED PROPELLER SLIGHTLY MORE EFFICIENT THAN FOUR-BLADED

It may be remarked, in conclusion, that there is one matter affecting efficiency where the practice of naval and merchant ship designers seems widely at variance. I refer to the number of blades used. Broadly speaking, naval practice is to use three-bladed propellers, merchant practice is to use four-bladed propellers. Model experiments indicate a small but distinct superiority, as regards efficiency, for three-bladed screws. The difference is so small, however—not over 3- or 4 percent—that it would be hard to demonstrate on full-sized ships except by most careful and rather expensive experiments. For my part, I believe that such experiments would bear out the model experiments and show a slight advantage as regards efficiency for the three-bladed propeller. Of course there are other factors involved, as where conditions require the minimum possible diameter. In such cases the four-bladed propeller might be slightly superior.

Important Advance in Pump Valves Decreases Cost of Pumping

USERS and prospective users of pumps will be interested to know that some decidedly valuable improvements in pump valve construction are now announced by the Worthington Pump and Machinery Corporation, of New York. An entirely different form of valve has

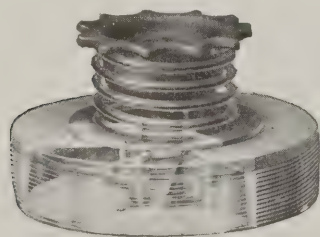


Fig. 1

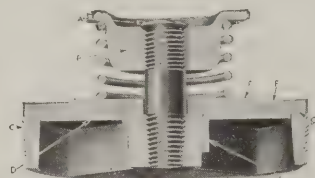


Fig. 2

been perfected which, when applied to service conditions that have been difficult for the older standard valves by causing them to cut and to leak, will eliminate both difficulties. It therefore increases the average pump efficiency; decreases the cost of pumping; and continually maintains the capacity of the pump at its maximum point.

After many years of building and operating pumps, the Worthington engineers have found that the principal cause of leakage is traceable to the excessive wear on the rubber, which while negligible in some cases is often quite bad. Thus Fig. 3 shows a photograph of a hard rubber valve after three months of a particularly hard service. Cracks and cuts caused by the valve seat and by the radiating ribs are plainly visible. Fig. 4 shows a medium rubber valve, also after three months of unusually difficult service. It is plain that the only way positively to prevent leakage with such ordinary valves in this condition is to remove and replace them with new valves.

To overcome this rapid and costly wearing, cutting and cracking action, the Worthington engineers have evolved the



Fig. 3

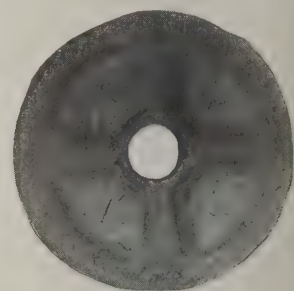


Fig. 4

new and novel type of valve shown in Fig. 2, known as the Worthington "Seal" valve for use when the conditions are too hard for the ordinary form of valves now in standard use.

This new "Seal" valve assures absolute tightness when closed, the manufacturers claim, because the rubber used is "flexible" and will always seat perfectly both at the hub and outer rim, its inner and outer seats, and so keep tight. Age and continuous usage do not cut grooves or cause cracks as has been demonstrated in the case of a flexible rubber seal used for one year in this new type of valve. At the end of the year there was no visible wear, there was no leakage, renewal was of course unnecessary and there was no cost for repairs.

The ingenuity and simplicity of this valve are evident upon inspecting Fig. 2. There are no screws, no bolts, no rubber rings, no nuts, no bushings, no rotating elements. The special new feature that makes this valve so good for hard service is the so-called "bottom plate." This is in effect a middle seat for the rubber valve proper. When the valve is closed this middle seat carries the entire load and prevents the rubber seal from cutting on the seats or ribs. This bottom plate moves up and down with the rubber, and so not only acts as a middle seat, but this middle seat is movable with the rubber and helps to keep the rubber valve in shape even when open. Thus all mechanical functions requiring strength and wear resistance are cared for by metal parts. The flexible rubber acts only as a seal against leakage.

All moving parts are light but made amply rigid. The lightness assures a smooth, quiet-running pump. The rigidity prevents the distortion that results in leakage.

It is not anticipated that repairs or replacements will be often required but the construction makes this easy when it does become necessary, and the cost of any possible repairs will be low because of the simplicity and inexpensiveness of all parts.

Efficiency Depends on Accurate Performance Records

Great Advantage in Knowing What a Vessel Is Capable of Accomplishing and Giving the Personnel a Mark to Shoot At

By C. J. Jefferson*

THE fundamental rule of sound business success is an accurate and true knowledge of production, selling and distribution costs for that business.

Temporary combinations of events may apparently disprove this axiom and while these circumstances exist, business success will occur in spite of the lack of this necessary primary knowledge. Then when the affairs of the world tend to restore themselves to normalcy, or perhaps sub-normalcy, the temporary period of success is broken down and due to the lack of the basic cost data, the problem instead of being met with good keen business judgment is treated with a wild hysteria which generally succeeds in completely demolishing the one time successful business.

It is this lack of cost data and an intelligent analysis of the various items that make up the basic cost which has resulted so disastrously to the numerous shipping companies that sprang up during the war time emergency when cost principles were ignored. It is this same lack of cost data which perhaps in a lesser degree makes the problem of the American merchant marine today so intangible and so subject to panicky attacks from both its friends and enemies.

There is, however, any number of good reasons why these basic costs have not been established. First of all, we have been willing to accept the statement that it costs more money to run our ships than it does for those operated under foreign flags and therefore instead of establishing a selling price by the true though more difficult method of first determining the basic cost, we have let our competitors set our sales price for us and we have endeavored to meet it.

This is not good business nor can a business established on this foundation carry on itself when outside help is withdrawn. The problem of establishing the basic cost is complicated, for the shipping business is subject to more variables, and each of these variables has a more definite effect than is the case in any other business.

The basic cost can be divided into five main divisions:

1. Maintenance and depreciation of equipment.
2. Insurance.
3. Cost of soliciting cargo.
4. Stevedoring.
5. Operation.

All of these divisions are more or less interlaced and yet each heading must be analyzed by people who are qualified in their particular phase of the question and their findings must be co-ordinated by a single head who shall establish the proper co-efficient for each value and unite the findings into a basic cost.

It is not possible in such an article as this to go into the details of organization or the necessary tabulations that must be made in each of these divisions in order that reasonably correct values can be established. In fact, the various routes of trade, the various types of cargo and service make it impossible to cover the entire merchant marine field with any one definite program of attack.

FORM FOR COLLECTION OF OPERATING DATA PREPARED

The force of the above statement has been made very evident to the writer in his work in the United States Shipping Board's Fuel Conservation Section, in establishing the

standards of performance for the United States Shipping Board vessels operating in different routes of trade. The chief difficulty has been to get the available data regarding the performance of engine department of the various vessels in such standard form that it could be compared to the performance of sister ships and in turn make possible comparison of one class with another, at the same time making due allowance for the various variables such as efficiency of personnel, efficiency of material, weather conditions, drafts and speeds, bottom conditions, ocean currents and numerous other variables. To this end the accompanying form has been drawn up and is now used. On this form, the operating data for the entire voyage are collected in a compact form suitable for analysis and comparison.

Sheet No. 1 contains the characteristics of the vessel under analysis, also a brief statement of the physical condition of the vessel on arrival at the termination of the voyage. This being made out by an inspector who boards the vessel as soon as possible after she has docked, and in some cases the vessel is boarded at Quarantine when he rides her up to the dock.

The ratings of the engineer officers as to "mechanical ability," "discipline," and "efficiency," are based on the observation, both of the men and the condition of the equipment of the department as well as an analysis of the performance throughout the voyage. This means intelligent analysis of their work list abroad and at home, careful inspection of the department to determine whether the equipment is functioning properly and is not simply well painted, that bilges and tank tops as well as floor plates are clean, that dangerous fire hazards due to fuel leaks and oil-covered tank tops and bilges are eliminated.

In fact it means an inspection and an analysis of actual conditions made by a careful and efficient engineer who will not be influenced by the personality of the operating force.

HOW RATINGS ARE ESTIMATED

The ratings given for personnel are based on general performance of the engine department crew. This is partially based on observation by the inspector, but must largely be made up according to their report of performance as given by their engineer officers. The equipment rating is based on observation and the operation rating is based on analysis of the physical condition and also on the efficiency of performance of the vessel for the entire voyage.

On a small chart on the bottom of Sheet No. 1 is roughly plotted the voyage so that the route can be seen at a glance. This is useful in cataloging the reports for comparative purposes.

Sheet No. 2 of this report is made up of a number of columns. Each column is given over to the different passages of the voyage. In case there are a greater number of passages than can be tabulated on this single sheet, any number of such sheets may be added to cover the entire voyage. These columns contain data which cover the major variables which will be met in operation and enable the person who is making an analysis of the voyage to locate the weak points of operation and make such recommendations as are necessary to improve conditions and build up the efficiency of operation.

The fuel performance is broken down into several factors such as fuel per twenty-four hours, miles per ton of fuel,

*Head, Fuel Conservation Section, United States Shipping Board, Emergency Fleet Corporation.

UNITED STATES SHIPPING BOARD

VOYAGE REPORT

PORT OF NEW YORK

S.S. _____ OPERATORS _____ VOYAGE N° VESSEL _____ VOYAGE N° OPERATOR _____

DESCRIPTION OF VESSEL

BUILDERS	TYPE	DESIGNED DWT.	Δ
LENGTH	BEAM	DRAFT	SPEED
ENGINE	H.P. RATED	LAST OPENED	LAST DRY DOCK
N° BOILERS	TYPE	FUEL TYPE	QUALITY

DATE _____ INDICATOR CARDS

R.P.M.	PORT	I.H.P.	L.P.	R.P.M.	STARBOARD	I.H.P.	L.P.
I.H.P.	H.P.	I.H.P.	2 I.H.P.	I.H.P.	H.P.	I.H.P.	2 I.H.P.
% LOAD				% LOAD			
CUT OFF				CUT OFF			

REMARKS _____

PERSONNEL	NAME	MECHANICAL ABILITY	DISCIPLINE	EFFICIENCY	PRESENT PHYSICAL CONDITION	RATE
ENGINEER					ENGINE ROOM	
CHIEF					MAIN ENGINES	
1 ST ASST.					PUMPS	
2 ND ASST.					CONDENSERS	
3 RD ASST.					DYNAMOS	
4 TH ASST.					REFR'G MACHINERY	
					BOILER ROOMS	
					BOILERS	
					FURNACES	
					BURNERS	
					HEATERS	
					F.O. HEAT COILS	
					PLUMBING	
					HEATING	
					LIGHTING	
					STEERING ENG.	
					WINDLASS	
					WINCHES	
					HULL	
					TANKS	
					DECK	
					CARGO HOLDS	
					QUARTERS	
					ROOMS	
					DECK HOUSES	
					REMARKS	

REMARKS _____

PERSONNEL	EQUIPMENT	OPERATION
A	A	A
B	B	B
C	C	C
D	D	D

REMARKS _____

FUEL SUMMARY

FUEL ON BOARD LEAVING	TONS
FUEL PURCHASED AWAY	TONS
FUEL ON BOARD ARRIVING	TONS
TOTAL FUEL CONSUMED	TONS

REMARKS _____

Fig. 1.—Sheet No. 1 of Vessel Performance Record

S.S. _____ VOYAGE _____		FROM DATE														
PASSAGE		TO DATE														
PASSAGE CONDITIONS	1	DURATION	PILOT STATION TO PILOT STATION	D.	H.	M.	D.	H.	M.	D.	H.	M.	D.	H.	M.	
	2	OBSERVED DIST. MILES PS-PS														
	3	HOURS REDUCED SPEED														
	4	HOURS STOP														
	5	REASON														
PASSAGE CONDITIONS	6	WEATHER CONDITIONS														
	7	DRAFT LEAVING	FORD AFT	MEAN		MEAN		MEAN		MEAN		MEAN		MEAN		
	8	DRAFT ARRIVING	FORD AFT	FOR		FOR		FOR		FOR		FOR		FOR		
CARGO	9	DISPLACEMENT TONS Δ														
	10	CARGO	TONS													
	11	CARGO	TYPE													
BALAST	12	PASSENGERS	FIRST CLASS													
			SECOND CLASS													
			THIRD CLASS													
SPEED	13	BALLAST	TONS													
	14	BALLAST	TYPE													
	15	WHEEL KNOTS														
OPERATING CONDITION	16	OBSERVED SPEED KNOTS														
	17	PER CENT SLIP %														
	18	AVERAGE R.P.M.														
	19	BOILER PRESSURE														
	20	H.P. CHEST PRESSURE														
	21	VACUUM	GAUGE	TEMP.												
	22	SUPERHEAT														
	23	H.P. CYL. C.O. OR N° OF NOZZLES														
	24	AVERAGE H.P.														
	25	AUX. EXHAUST BACK PRESS.														
OIL WATER	26	SEA INJECTION	F°													
	27	OVERBOARD DISCHARGE	F°													
	28	BOILER FEED	F°													
	29	STACK TEMP.	F°													
	30	FURNACE DRAFT	INS.													
	31	FRESH WATER 24 HRS. TONS														
	32	FRESH WATER TOTAL TONS														
	33	LUBRICATING OIL 24 HRS. GALS.														
	34	CYLINDER OIL 24 HRS. GALS.														
	FUEL PERFORMANCE	35	HRS. DOCK PILOT STA.	TO FROM												
36		FUEL CONS. DOCK P.S.	TO FROM													
37		FUEL CONS. AT SEA	TONS BBLs													
38		FUEL CONS. 24 HRS.	TONS BBLs													
39		LBS. FUEL PER H.P./H.R.														
40		LBS. FUEL PER MILE														
41		MILES PER TON ACTUAL														
42		MILES PER TON STANDARD														
43		EFFICIENCY														
PORT OPERATION		44	PORT OF													
	45	N° OF DAYS IN PORT														
	46	TOTAL PORT CONS. TONS BBLs														
	47	AVE. DAILY FUEL PORT CONS. TONS BBLs														
	48	N° OF BOILERS USED IN PORT														
	49	N° OF WINCHES USED IN PORT														
	50	WINCH HRS.														
VOYAGE EXPENSE				AMOUNT	COST	SIGNED										
51	FUEL ABROAD					ENGINEER INSPECTOR										
52	WATER ABROAD					SIGNER										
53	STORES ABROAD					HEAD FUEL CONSERVATION SECTION										
54	REPAIRS ABROAD N° E D S COST					SIGNED										
55	REPAIRS AT HOME N° E D S COST					CHIEF ENGINEER INSPECTOR										

Fig. 2.—Sheet No. 2 of Vessel Performance Record

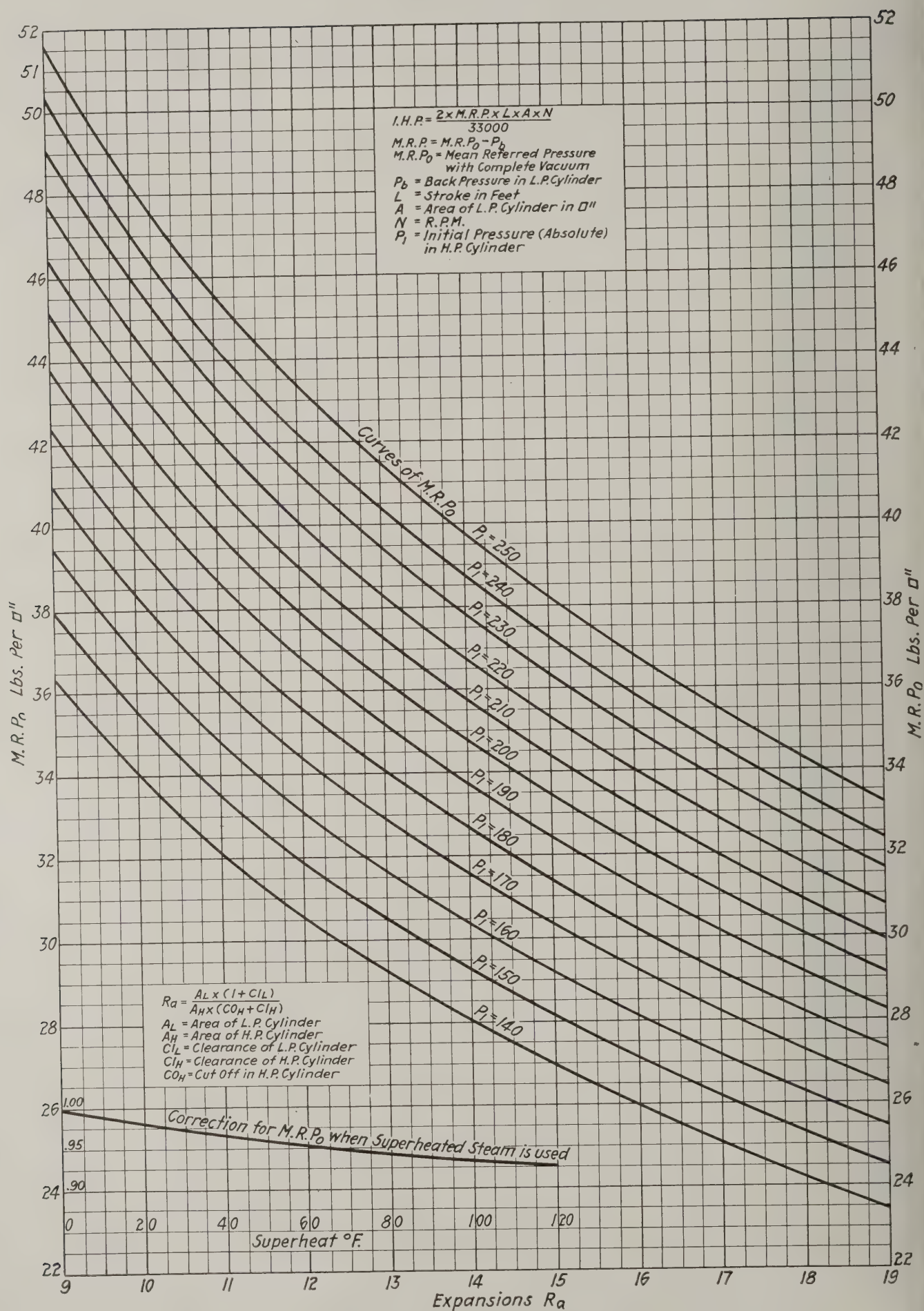


Fig. 3.—Chart for Determining Horsepower of Reciprocating Engines

fuel per horsepower hour during steaming period at sea. The fuel per horsepower hour factor, while one of the most important is one most difficult to obtain accurately and must therefore be used very guardedly.

In the case of turbine-driven vessels, the shaft horsepower factor is determined from the horsepower curves of the turbine and the average logged revolutions per minute, initial steam pressure, vacuum, and number of nozzles used for this determination.

In the case of reciprocating engines, actual cards are worked out. Then from the measured cut-off, initial pressure and back pressure taken from these same cards, the horsepower is computed, using the curves shown on Fig. 3. The relation of the actual to the theoretical horsepower gives the card factor. Then from the logged high pressure cut-off, high pressure chest pressure, the revolutions per minute and the vacuum or low pressure back pressure, and using the above mentioned back pressure, the indicated horsepower for each passage is computed.

PORT CONSUMPTION

The fuel consumed in port, both at anchor and in moving from dock to pilot station, and from pilot station to dock is tabulated so that an excellent sea performance may be checked and shown not to have been made at the expense of excessive port consumption. The efficiency of performance is based on the ratio of actual miles per ton of fuel to the standardized values. The methods of obtaining these standardized values has been explained in previous articles in this publication.

In determining these standards, this form of voyage report has been found most useful and by continuing to check the standards with these reports, the standards will be gradually revised so that they take care of a greater number of variables than was possible at the time they were originally drawn up. It is felt that this voyage report form when used by competent and experienced engineers will give the data for the engine department operation in such a form that the co-ordinator can set his co-efficient on this phase of the basic cost with a reasonable degree of certainty.

In addition to this, however, it will be necessary to handle the other phases in as thorough a manner and when the merchant marine business is subjected to this type of scrutiny, then will it be able to establish a sound business foundation which will enable it to meet fluctuating markets, crises in the affairs of the world's trade, peak loads and depressions, and still carry on its business in a safe, sane and sensible manner. When those times arrive which are so apt to arrive in any business, when the life of the business hangs on the decision of the moneyed powers or even the Government itself, as to whether or not it be given aid, then the facts of the case, through reliable back cost figures can be so presented that a just and fair decision can be rendered, help given and remedy applied so that the business can continue to function, then will the merchant marine be a reliable business which other big business systems will support.

Appendix

METHOD OF USING RECIPROCATING ENGINE HORSEPOWER CURVES

Having determined the value of R_a (see Fig. 3) read upward in vertical line P_1 curve which corresponds to the absolute initial pressure or absolute pressure in high pressure steam chest. At the point this vertical line intersects the P curve carry over on a horizontal line and read the mean referred pressure (with complete vacuum) value, which is the mean referred pressure on basis of absolute vacuum in low pressure cylinder.

This mean referred pressure (with complete vacuum) value is transformed into Mean Referred Pressure or M.R.P. by subtracting the back pressure (P_b) in low pressure cylinder.

Modern Boiler Room Economies

By J. J. Nelis*

MARINE engineers are naturally conservative, and the boiler being the heart of the power plant, in fact of the ship, they have been reluctant to make any changes that might cause operating delays. As a result of this there has been little, if any, change in marine boiler practice for a great number of years except a small increase in pressure and for certain large powers the adoption of the watertube boiler.

During the last few years land plants, where economy is paramount and reliability a secondary consideration due to their usually having spare boilers installed, a great number of vital changes as regards economy have been tried out and carried to a successful conclusion, so that these new devices are now standard practice.

CHANGES IN LAND BOILER PRACTICE

The three most important changes in land boiler room practice have been:

1. The adoption of better combustion methods, such as stokers and increased furnace volume. Neither of these have been found advantageous on ships to date, but are one of the possible future developments that will slowly but surely take place, particularly when the present era of oil fuel is passed, and most of the merchant ships are again using coal for fuel.

2. Another main change has been the adoption of superheaters which add to the amount of heating surface passed over by the hot gasses, thereby increasing the overall boiler economy, and also transfer to the steam heat units which increase the steam economy of prime movers and therefore the overall power plant efficiency.

3. The third main change has been the installation of economizers to add as nearly as possible all of the sensible heat to the water in a separate chamber where it can be more efficiently accomplished, and leaving to the boiler only the work of adding the latent heat of evaporation which is a duty that should be done by the boiler, and not, as at present in marine practice, using the boiler as a combined economizer and steam generator.

In present day practice, with a typical Scotch boiler installation using Howden or similar heaters to absorb some of the heat of waste gasses, the average boiler room economy, hand fired with coal, is about 60 percent of the total heat of the fuel. With a similar installation, using oil as fuel, an economy of not over 65 to 70 percent of the heat of the fuel is an average condition.

MEANS OF INCREASING BOILER EFFICIENCY

As against present day practice, it is possible in marine power plants at a relatively small cost, to add superheaters and economizers, giving an overall efficiency of not less than 85 percent of the heat in the fuel, which will closely approximate the economy found in large central stations ashore.

The above is based on using the present equipment aboard ships. It is possible when building new ships to arrange for a considerable increase in furnace volume, and also in steam pressure. The latter, however, will require new types of prime movers but, if installed and intelligently operated, will place the American merchant marine ahead of all its competitors as regards the economy of its boiler room and complete propelling equipment.

The new inner harbor-navigation canal at New Orleans, La., which has been built by the Board of Commissioners of the Port of New Orleans, an agency of the State of Louisiana, at an expense of \$20,000,000, will be formally opened on May 5. This canal connects the Mississippi river with Lake Pontchartrain.

* Secretary, Foster Marine Boiler Corporation, New York.



Fig. 1.—Electric Drive Ship Independence

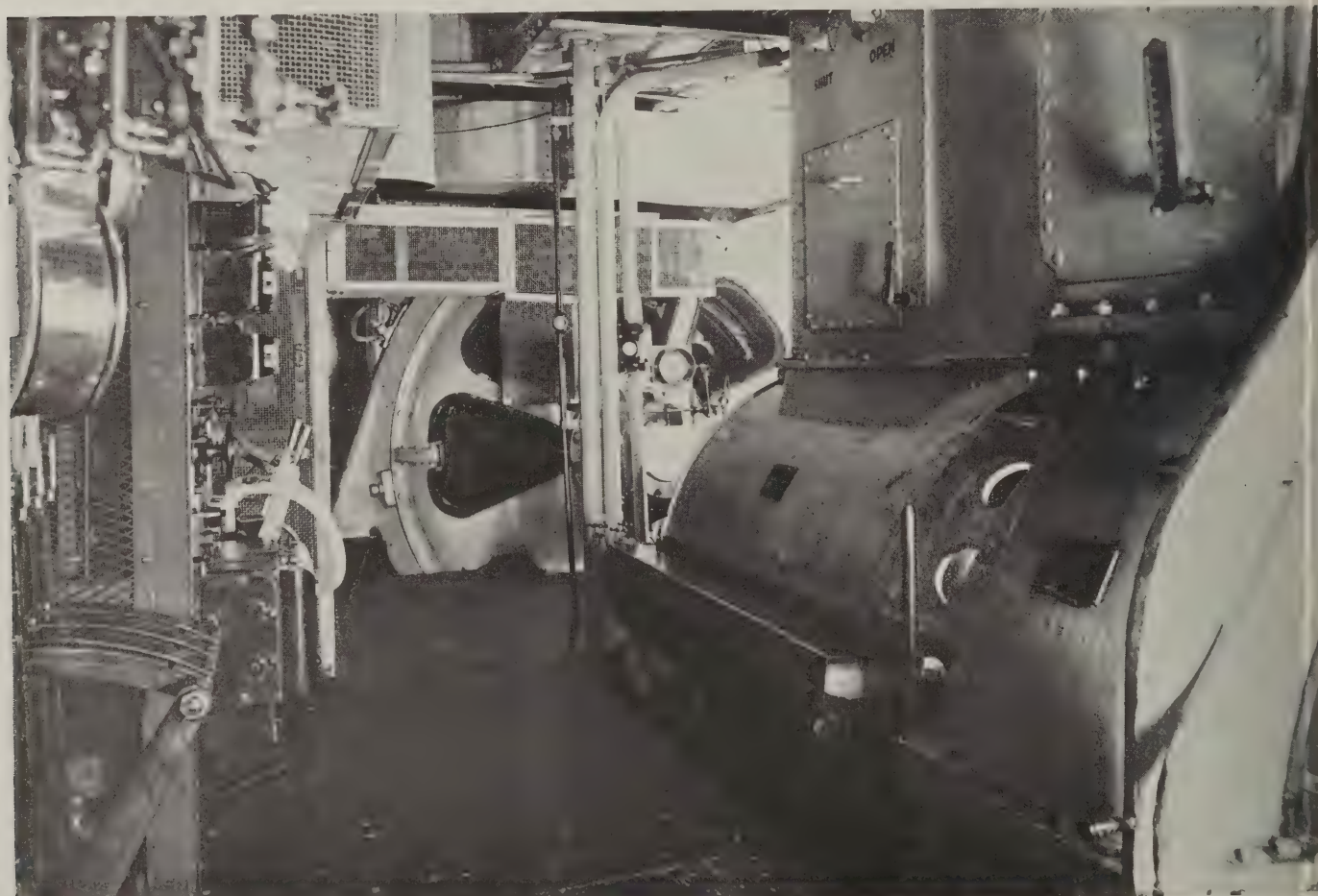


Fig. 2.—Engine Room of Electric Drive Ship Independence

How to Get a Shaft Horsepower Hour for All Purposes with Steam on from 0.75 to 1.00 Pound of Oil

By W. C. Watson and John Thomas*

No appreciable departure from established marine practice has been made in the form of propulsion discussed in this article. The authors have had in mind primarily reconditioning work, retaining in many cases the same boilers, some of the original auxiliaries and adding superheaters. But the turbine electric apparatus described lends itself to the introduction into marine practice of many of the important features that have been developed in connection with large power houses on shore, such as, for instance, the adoption of high steam pressures and temperatures, as well as advanced systems of feed water heating and auxiliary layouts, including evaporators.

THE development of turbine electric drive for ships has been so rapid during the last few years, that many are unaware of the results that can be obtained with this form of propulsion and the contribution it can make to the American merchant marine in establishing it on a sound, economical and competitive basis.

At a time when so many ships must be reconditioned before they are competitive, careful consideration should be given to the possibilities of this form of propulsion.

The turbine can be designed in its simplest form. Reversing elements are eliminated, as reversal of the ship is accomplished by a simple change in electrical connections. The generator to which the turbine is directly connected is practically identical in design with the type employed in large power stations, and which has proven itself reliable twenty-four hours per day for years. The motor is direct connected to the propeller shaft and is of the steel mill type. The entire equipment is controlled by apparatus successfully demonstrated, particularly in steel mill and electric railway service, on shore.

PROPELLING EQUIPMENT

The propulsion equipment involves simple rotation, no rubbing surfaces other than journal bearings, and the power delivered to the propeller is transmitted across an air gap of considerable proportions, which is, for all practical purposes, an elastic medium, thus eliminating shocks and excessive stresses imposed upon the apparatus from the propeller and the elasticity of the ship's structure.

Figs. 3, 4 and 5 show rotors of the turbine, generator and motor respectively, and give a good idea of the rugged construction of the major rotating parts comprising complete electric drive equipment for a single screw ship. For the ordinary twin screw vessel there would be two turbine generators and two motors. In any turbine electric drive equipment the weight of the major rotating parts represents only about 30 percent of the total weight of the machines.

Figs. 6, 7 and 8 show complete propulsion turbine generator, motor and control apparatus. The principal electrical currents are generated in stationary parts, which affords the simplest and most reliable cable arrangements between generators and motors. The component parts of large elec-

trical machines are by necessity mechanically strong, which introduces the highly desirable quality of maximum reliability into machines of this type.

Enough experience has been obtained during the last ten years with electrically driven ships to enable us to say that the cost of maintenance of this form of ship propulsion machinery is much less than that of any other type. Experience of large operators of reciprocating engine machinery indicates

that the average cost of upkeep is several dollars per shaft horsepower per year, whereas experience with electrically driven vessels, such as the *Eclipse*, *Jupiter* and Coast Guard cutters, indicates that the cost is practically nil.

A ship maneuvers with turbine electric machinery much as it does with reciprocating engines, except that the turbine generator is not reversed, which greatly simplifies maneuvering and lessens wear and tear on the

machinery. The efficiency is the same in the reverse direction as in the forward, also 100 percent power is available for astern operation.

COMPARATIVE WEIGHTS

In comparison with electric drive for small cargo vessels requiring from, say, 2,500 to 4,000 horsepower, the geared turbine is somewhat lighter. However, in the larger powers in the case of ordinary passenger and cargo boats, when it becomes necessary to break up the turbine into two or more units per propeller shaft, and the extra piping, cross over connections and oiling system are taken into consideration, the weight of electric drive is approximately the same as that of the geared turbines.

In some of the large liners the geared turbine installations are much heavier than equivalent turbine electric installations. In practically every case the turbine electric drive is about one-half the weight of reciprocating engines.

INCREASED FIRST COST JUSTIFIED

As far as the costs are concerned, turbine electric drive is somewhat more expensive than geared turbines for ordinary vessels requiring from 2,000 to 4,000 horsepower per screw, but when the added reliability, low cost of upkeep and superior maneuvering ability, as well as excellent economy and flexibility of arrangement, are taken into consideration the increased first cost is justified in many cases. For vessels requiring above 4,000 shaft horsepower per screw there is very

In considering any form of propulsion reliability is the most important factor. In electric drive, we have apparatus which has successfully demonstrated itself for many years in the solution of difficult mechanical problems encountered on land and sea. No apparatus can be supplied to ships with as few changes from highly developed land practice as that comprising turbine electric drive.

*Engineers with the Marine Department, General Electric Company, Schenectady, N. Y.

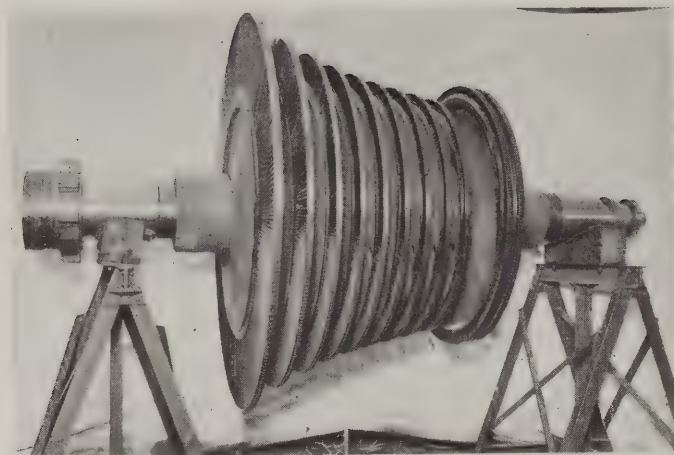


Fig. 3.—Propulsion Turbine Rotor

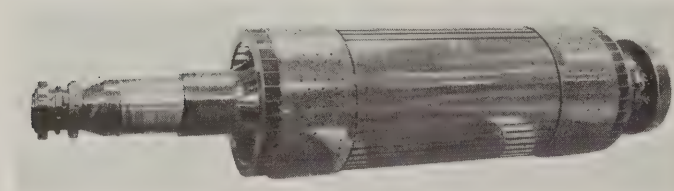


Fig. 4.—Propulsion Generator Rotor



Fig. 5.—Propulsion Motor Rotor

little difference in first cost between turbine electric drive and geared turbine drive, except in the case of certain passenger liners where electric drive would cost considerably less than geared turbines now used.

Aside from the advantages already mentioned, the special contribution which electric drive can make to the solution of the ship operators' problem is dependent upon two special

characteristics in which it is unique; first, the ease with which operating conditions can be measured and recorded, and, second, the ease with which the favorable conditions can be arrived at and controlled. The advantages of the first are not always frankly conceded. It has been said that the same

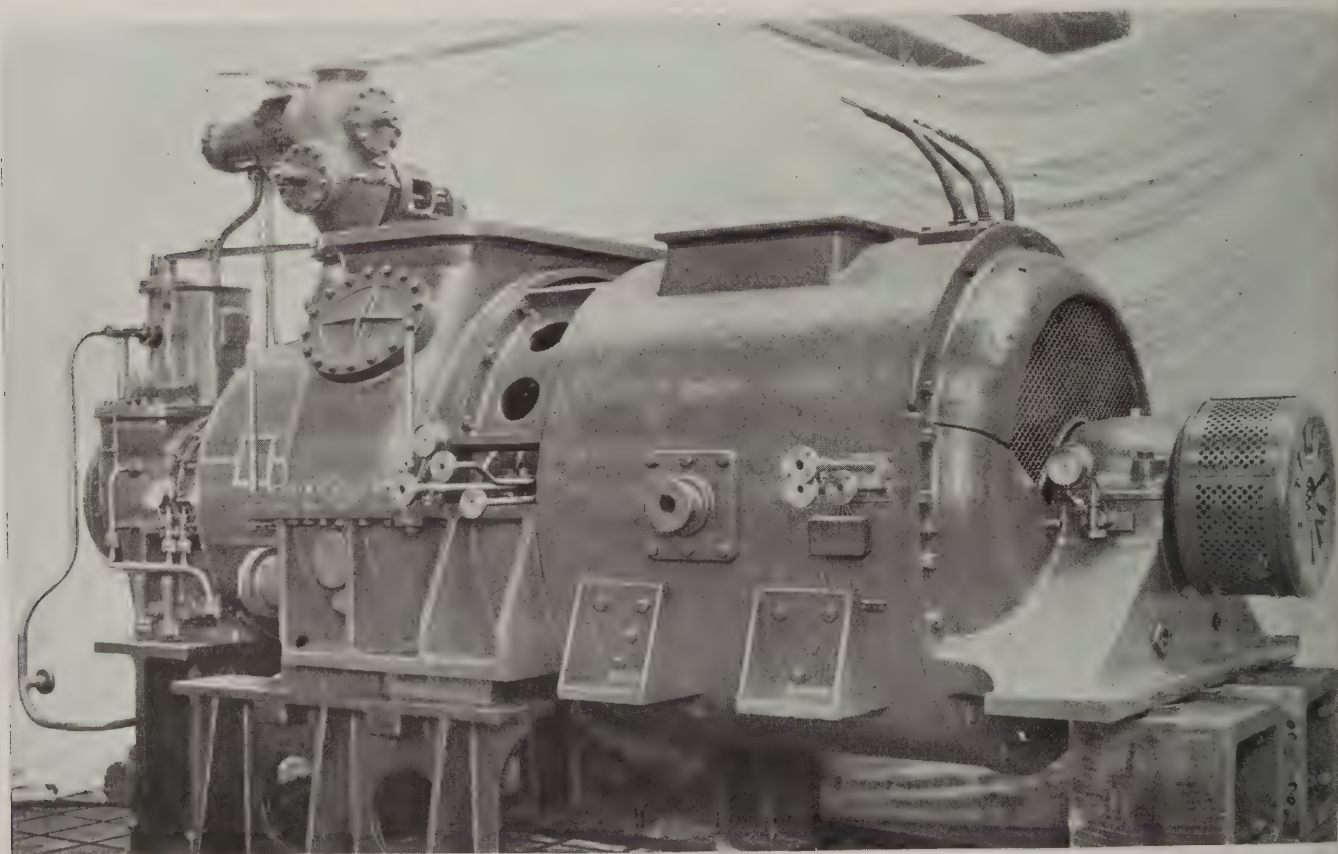


Fig. 6.—The Propulsion Turbine Generator

Table I—Machinery Layout—Single Screw Vessels

Name	Drive
Main turbines	Steam
Light and ventilation fans	Electric
Excitation	Electric
Fans for ventilating propulsion motor	Electric
Refrigeration	Electric
Sanitary pump	Electric
Lubricating oil pump	Electric
Oil cooler circulating pump	Electric
Circulating	Electric
Feed pump	Steam
Forced draft blowers	Steam
Steering gear	Steam
Twin beam air pump	Steam
Oil pump for burners	Steam
Fresh water pump	Steam
Intermittent service pump, including fire, bilge, ballast, fuel oil transfer, etc.	Steam
Heating of fuel oil	Steam
Galley	Steam

out admitting or extracting steam to or from the main turbine, and without admitting auxiliary exhaust steam into the main condenser. Table I lists in detail the selection of auxiliaries to accomplish the heat balance described above.

For passenger vessels and large freighters requiring twin screws and from 6,000 to 22,000 shaft horsepower at designed full load, Fig. 10 (curves A, B, C and D) gives the fuel and total steam per shaft horsepower for all purposes. As in the case of the single screw vessels, sufficient auxiliaries are driven by steam to produce a feed water temperature of approximately 230 degrees F. with auxiliary exhaust pressure of 10 pounds gage, without admitting or extracting steam to or from the main turbine, or exhausting auxiliary exhaust

Table II—Machinery Layout—Twin Screw Vessels

Name	Drive
Main turbines	Steam
Light and ventilation	Electric
Refrigeration	Electric
Steering gear	Electric
Lubricating oil pump	Electric
Oil cooler circulating pump	Electric
Fresh water pump	Electric
Sanitary pump	Electric
Excitation	Electric
Fans for ventilating propulsion motor	Electric
Feed pump	Steam
*Circulating	Steam
Forced draft blowers	Steam
†Air pump twin beam	Steam
Condensate pump	Steam
Air ejector (for 10,000 shaft horsepower and above)	Steam
Oil pump for burners	Steam
Intermittent service pumps	Steam
Heating fuel oil	Steam
Galley	Steam

*Electrically driven in the case of 6,000 shaft horsepower vessels.

†For 10,000 shaft horsepower vessels and above electrically driven condensate pump and air ejectors.

steam into the main condenser. Again evaporators are not included in these calculations. Table II shows the arrangement of the machinery.

In the analysis of both single screw and twin screw vessels the small turbine generators used for light, power and excitation will operate condensing under the same steam conditions as the main turbine, and at sea will normally exhaust into the main condenser, a small auxiliary condenser being provided for port and emergency use.

Electric Auxiliaries An Economic Necessity

Lines Along Which Our Efforts Must Be Expended to Minimize the Fuel Bills, Machinery Maintenance and Cost of Handling Cargo

By Walter Thau*

EVERY industry of any standing today has gone through a transition, forced by the necessity for lower costs, better and more uniform product and increased production. Of all the factors participating in these industrial revolutions, electricity stands indisputably first. Without electricity, the results could not have been obtained. Similarly, the ship must undergo a change, which is forced by the necessity for reduced operating cost and general economic improvements. Fortunately the movement has already received the impetus, and is successfully launched. The aggressive shipping interests already realize that great improvements in methods and performance are available by the use of electrical apparatus, and their interest in the situation is manifested today by a definitely increasing activity which is always a good indication of the outcome. Electricity will do for the ship what it has done for the steel mill, the mine, the logging camp, the textile mill, the rubber mill, the cement mill, and hundreds of varied manufacturing establishments.

Naturally enough the arrival of the motorship was almost simultaneously accompanied by the adoption of electrical auxiliaries. The builders of motorships soon recognized the waste encountered by the use of the donkey boiler and steam auxiliaries, and changed over to the all-electrical auxiliary system. This latter practice is in vogue almost universally today, a fact which furnishes sufficient proof of the suitability

of electrical ship auxiliaries, as well as the resulting economies effected by their use. The motorship, which in itself constitutes a tremendously important step toward economy, therefore set, or at least hastened, the pace toward the ultimate answer in the economical operation of ships, even though their first installations of electric auxiliaries were considered somewhat in the light of a necessity. The performance of the electrical auxiliaries on motorships during the last 10 or 12 years has proven and thoroughly established their reliability for the service.

In the case of steamships, however, the conditions are somewhat different. Here there is plenty of steam producing means available, and, with few exceptions, practice has doggedly adhered to steam auxiliaries. This practice is deserving of some sympathy, however, even though the justification for it is not apparent. The attendants knew no other than steam machinery, and for the most part the equipment was built and supplied by the shipyards whose machine shop constituted no small proportion of the total plant. However, this is no time for accepting passive consideration of electrical auxiliaries, even on steamships. The future American competitive ship will be the ship equipped with electrical auxiliaries, regardless of its type of propelling equipment.

ECONOMY IN FUEL CONSUMPTION

The improved fuel economy of electrically driven machinery is due entirely to the great efficiency with which electricity can be generated, transmitted and used. The in-

*General engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Installation of a flexible centralized generating plant makes it possible to convert the stored energy in fuel into a useful form of energy with the least expenditure of labor and with minimum losses. The transmission of electrical energy entails less loss of power than the transmission of energy in any other practical form. Furthermore, there are no losses in the electrical transmission systems when no power is being transmitted, which is a very important item when compared with the steam systems in which the condensation and leakage losses assume a considerable proportion, especially in cold climates. In the case of steam deck auxiliaries, the pipe line losses may easily amount to 25 percent in many cases. As a user of power, the electric motor supplied with energy from a central plant is in a class by itself, especially when compared with the donkey engine. These considerations are particularly important, in the case of deck machinery, steering gears and any machinery not located close to the boilers.

For existing ships, we have available two kinds of generating plants, one in which the prime mover is the turbine, and the other in which the prime mover is an internal combustion or Diesel engine. From a service performance standpoint, either plant is entirely satisfactory. However, from a fuel consumption standpoint, the Diesel plant has much in its favor. In most cases, the type of prime mover will be

dictated by the type of ship, that is, whether it be a steamship or a motorship. However, the Diesel driven generating plant must not of necessity be considered out of place on a steamship, as will be apparent later. Actually, the selection of the plant necessitates a complete economical analysis for the reason that our final interest is in the net monetary results.

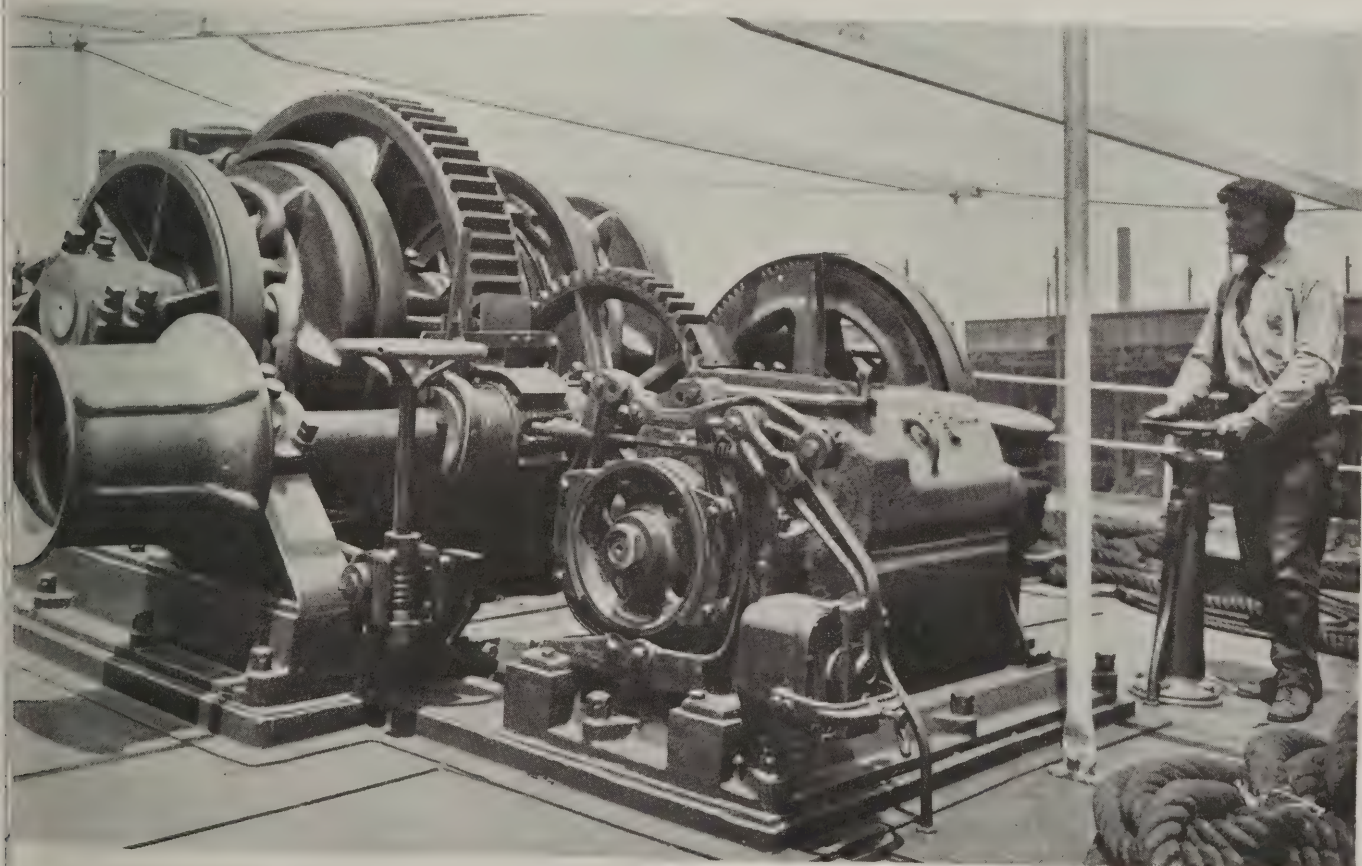
Upon our ability to reduce our operating costs to actual rock bottom depends our future as a maritime nation. It is of paramount importance, however, that any improvements bear strict economic analysis when viewed with the ship problem as a whole. We must not accept a particular system, if the net result does not show an economic gain, even though it may, for instance, effect a very attractive saving in fuel. The problem of transporting and handling cargo at the least possible cost per unit, with the quickest turn-around, and with real service to the shipper, requires that the highest possible economy of operation be attained.

The auxiliary equipment on a ship is conveniently classified into two groups, namely, the deck machinery, including the winches, windlass, capstan and steering gear, and the engine room machinery, including the pumps, compressors, blowers, etc. The deck auxiliaries present some very interesting application and design problems, whereas the engine room auxiliaries present no problems of any real interest or concern. The economical advantages of the electrical deck auxiliaries are readily established. In the case of the engine room auxiliaries, however, a deeper analysis is necessary to show the improvements to be gained by the use of electrical equipment.

For this reason, the two classes will be discussed separately.

DECK AUXILIARIES

Considerable difficulty is encountered in securing reliable data on the power consumption of steam winches. Such data as have been obtained by actual test vary considerably.



Electrically Operated Anchor Windlass on the Motorship William Penn

Some of the variation can be accounted for by the difference in the hook loads, as it is obvious to those who have studied the field that the fuel required per ton of cargo handled varies considerably with the hook load, especially for loads under two tons. The remaining inconsistencies in the data are attributable to differences in condensation and leakage losses, differences in the initial and exhaust steam pressures, the relative condition of the engines, and the manner and method of handling the cargo, all of which are subject to wide variation.

ECONOMY

On the basis of carefully selected test data, supplemented by conservative calculations, it is not difficult to arrive at the relative fuel consumptions of the various types of winch

by the use of electric winches, due to the fuel saving alone, not to mention the saving in maintenance, the more expeditious handling of the cargo, and a number of very desirable but intangible advantages. It is only necessary to analyze the facts in any given case to show the advantages resulting from the use of electrical machinery.

MAINTENANCE

Maintenance is a very important consideration and has a proportionate bearing upon the final economical analysis. Here it has been established by practice that the maintenance costs of properly designed and applied electrical machinery have been practically negligible. This condition is as it should be, and as was predicted several years ago. It is true that there are indisputable instances where electrical appa-



Motorship William Penn. The Deck and Engine Room Auxiliaries of this Vessel are All Electrically Operated

systems. The following figures, therefore, are believed to represent the results of a conservative analysis. The relative proportions, however, are subject to difference of opinion, depending upon the data used in making the analyses. For instance, actual test data are available which show the fuel consumption of reciprocating steam winches to be more than 20 times that of electric winches supplied with power from Diesel driven generators, under practically identical conditions of cargo handling. Other cases show this ratio to be in the order of 12 or 14 to 1.

- (a) Electric winches supplied with power from Diesel engine driven generators (1)*
- (b) Electric winches supplied with power from geared turbine driven generators (condensing)..... (3 to 3½)
- (c) Reciprocating steam winches (15)**

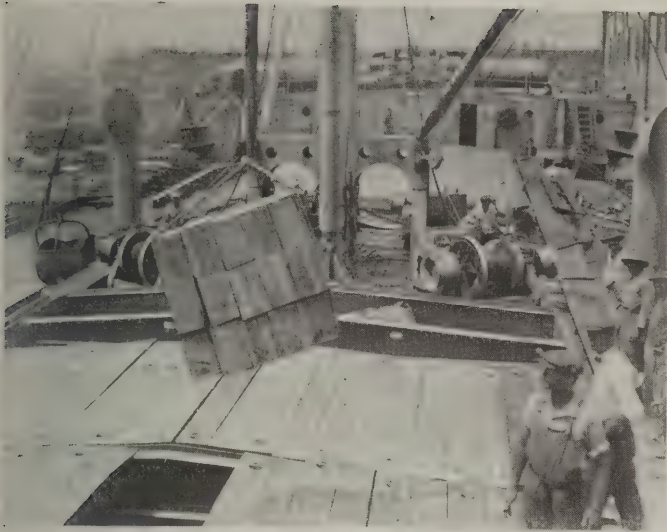
*The fuel consumption for (a) is taken as unity for the sake of convenience.

**By assuming ideal conditions, and calculating the steam consumption for deck winches, results are obtainable showing a consumption of 3½ times that of the electric winches supplied with steam turbine generator power. It has been impossible, however, to locate actual test results anywhere near this figure, all being higher.

Analysis shows that in the case of the ordinary cargo ship, there is a saving equivalent to \$15,000 to \$25,000 to be had

ratus on board ship (particularly deck equipment) has necessitated considerable maintenance costs. However, proper examination of these cases shows that the apparatus involved is usually either of insufficient quality, improperly constructed, misapplied, or improperly attended. Deck equipment, in particular, requires a strictly high-grade class of electrical apparatus. There are several electrically equipped ships in service today which carry a very commendable record relative to their electrical auxiliaries, which incidentally are of high quality. It is to the electrical manufacturer's interest, as well as the shipbuilder's and ship operator's interest to insist upon strictly high standard and rugged apparatus. The better the quality, the more profitable is the investment.

Excessive maintenance costs are eliminated by careful selection of electrical equipment, and incidentally this is true of any kind of apparatus. We must not lose sight of the severe requirements imposed by deck winch service. Suitable apparatus can be supplied only after a thorough study and understanding of the problems involved. To obtain the proper results, it is necessary to design the motor, controller and resistor as a unit, and each part of the equipment must function with proper inter-relation, and the combined result



Forward Winches of M. S. William Penn



After Winches of M. S. William Penn

must be that which is required by the most expeditious, most economical and safest handling of the cargo.

Another important factor to be reckoned with in applying deck electrical apparatus is the deleterious effect of sea water. Unless extreme care is given to this consideration in the design and construction, and the apparatus made watertight to prevent the ingress of water when subjected to the wash of solid seas, nothing but trouble can be expected.

These are the reasons why only high-grade apparatus is suitable for the service. The maintenance of electrical equipment so designed and applied is considerably less than that of steam equipment including the steam lines.

OPERATION AND PERFORMANCE

In regard to the operation and performance, the salient features inherent in the electrical equipment are all that can be desired, and they may be summarized as follows:

The electrical equipment is capable of ample overload capacity. Its performance is uniform and independent of climatic conditions encountered. It is ready for operation at all times, and requires no preliminary warming up. Its efficiency remains constant throughout its life. It affords any desired degree of control of the loads and is positive in its

functioning. Its inherent characteristics are ideally suited to the load requirements in that it handles heavy loads at relatively low speed and light loads at relatively high speeds, and its extreme flexibility enables designs and arrangements to meet any desired condition.

INSTALLATION

The electrical equipment affords the greatest flexibility and convenience in installation for the reason that its location is not influenced by a desire to place the equipment in proximity to steam pipes or boilers. The cables for transmitting the electrical energy can be installed where most convenient, and their installation made permanent, whereas steam pipes must be installed with the idea of convenience and accessibility for inspection and maintenance. The maintenance of steam pipes is a very serious problem in many installations, while, on the other hand, the maintenance of properly installed cables of suitable quality is nil, barring, of course, mechanical injury.

RELIABILITY

It is doubted whether anyone would question the reliability of electrical apparatus for deck service. Electrical

Deck Winch Controller with Handle
Unshipped for SeaDeck Winch Controller Open for
InspectionDeck Winch Controller in Operating
Position

apparatus has not only proven 100 percent reliable in the hundreds of thousands of cases where it is applied on land, but also the large number of electrical installations on ship-board have proven its entire reliability. The simple rotation of electrical machinery with the consequent absence of wearing surfaces, except the bearings, is the principal reason for its record of reliability. The deck machinery constitutes the most severe application for electrical apparatus on board ship, and to insure its reliability it is merely necessary to build the equipment sufficiently rugged and watertight.

ENGINE ROOM AUXILIARIES

In the case of motorships, electrically driven engine room auxiliaries are the obvious and natural selection. In the case of steamships, however, there may be some room for argument in regard to the necessity for the improved economy afforded by the electrical system.

It is considered by many that steam auxiliaries are preferable for engine room service because their exhaust steam can be used for feed water heating. Nevertheless, the amount of steam consumed by the engine room auxiliaries, particularly at sea, is tremendous, and amounts to from approximately 20 to 30 percent of the total steam used at sea, depending upon the type and size of ship and propelling machinery. It has been argued that the substitution of electric for steam auxiliaries reduces the available auxiliary exhaust steam to a value below that required for feed water heating, and that for this reason the auxiliaries should be steam driven.

In view of the fact that the energy in the steam can be much more efficiently utilized by resorting to large expansion ratios, it is obvious that as much of the generated steam as is possible could be better used under more favorable conditions, that is, in auxiliary turbine electric units operating condensing while in port, and non-condensing, if necessary, at sea. Should there be insufficient exhaust steam for feedwater heating, it would not be uneconomical to bleed the main engines a sufficient amount to make up the balance required.

Analyses which have been made on this basis show that it is quite possible to make savings of fuel up to 10 and 15 percent in some cases of the total steam generated by the boilers of a ship with the usual steam engine room auxiliaries, not to mention other more intangible savings.

The amount of steam to be saved, or the net reduction in fuel consumption resulting from the electrification of engine room auxiliaries would depend entirely on the kind of ship and proportion of auxiliaries to main units. Economic analysis would have to be made for each particular case or each particular class of ships.

MAINTENANCE

By giving the proper care and inspection to the engine room machinery, its maintenance should be extremely small. One common cause for repairs in the case of engine room electrical machinery is the entrance of salt water into the machines, which results in grounded circuits and improper

commutation. However, by suitably protecting the motors, this cause can be eliminated. A drip-proof cover over the top of the apparatus will effectively prevent dropping water from entering the machine, and at the same time will not obscure the vital parts from inspection. In some cases where the motors are located in the bilge, it is desirable to resort to the enclosed, watertight arrangement. As a general rule, it will be found that apparatus which is easily and readily inspected will show the last maintenance.

OPERATION AND PERFORMANCE

None of the engine room auxiliaries presents any serious problem in motor application. The requirements for the most part call for continuous running, constant duty motors, having simple starters. The flexibility of the electrical system is so great that any desired performance or adjustments can be had readily.

INSTALLATION

Here again, the flexibility of the electrical system lends itself to the requirements of practically any installation arrangement, and the motors can be located wherever it is most convenient for the apparatus that they drive. The cables and controlling appliances can be installed wherever desired, and either manual or remote control can be supplied.

RELIABILITY

Here again, the past performance of electrical apparatus is sufficient testimony in behalf of its reliability, and it is a very simple matter to adequately take care of the light requirements of engine room apparatus.

INTANGIBLE ADVANTAGES

The following is a list of the most important intangible advantages of electric auxiliaries, as compared with steam:

(a) The electric auxiliaries are ready for operation on instant notice, and they eliminate the necessity for keeping steam on steam lines and valves of engines partially cracked so as to be able to operate the engine on short notice, and also to prevent these parts from freezing in cold weather.

(b) Any desired arrangement of control can be obtained with the electrical machinery, and, furthermore the control may be located wherever convenience dictates.

(c) The electrical machinery is considerably quieter in operation, and infinitely cleaner, as the reciprocating noises are eliminated, as also are the leaks from valves and pistons.

(d) In many respects, the electrical equipment is safer from the standpoint of injury to personnel because the voltages used are not sufficiently high to cause danger to life.

(e) From the standpoint of correct application to load requirements, the electrical equipment is far superior to the steam, in that the performance requirements can be very conveniently and accurately studied by the use of electrical instruments, thus placing the engineer in a position to know what he is doing, rather than to guess at his application.

(f) Electrical machinery adds to the living conditions on board ship, by virtue of the elimination of hot steam pipes, which often must be laid in locations where they are most objectionable.

An Economizer That Requires No Outlay

THE installation of economizing equipment in the boiler and engine room entails a first cost that must be balanced against subsequent fuel savings. If the first cost were eliminated, operators would never question the advisability of adopting such equipment. A real source of economy requiring no investment actually does exist in the engine room of every ship, but it is too often overlooked by the staff.

How this economizer can be utilized will be explained in the June issue of **MARINE ENGINEERING & SHIPPING AGE**



Steamship George Washington, Flagship of the United States Lines

Tuning Up the Engine and Boiler Room

Written on Board the George Washington as a Good
Example of What Can Be Done With Existing Ships

By William Bunker*

In order to keep a ship's propelling unit in an efficient operating condition it is first necessary to have well designed and well built boilers. Although many types have been designed and many more probably will be, the Scotch boiler leads today. There are many well known and competent engineers, however, who believe that a suitable multitube boiler when designed with sufficient steaming space is a better and more efficient unit than the Scotch boiler. This, however, is controversial.

The usual rule of thumb method for designing a Scotch boiler is to allow from 42 to 44 square feet of heating surface to one square foot of grate surface. This, in the opinion and experience of the writer, is erroneous. Some years ago the writer had charge of a vessel operating in the China trade, in which the boilers were originally fitted with 42 square feet of heating to one square foot of grate surface. This was changed by reducing the length of grate bars and constructing special bridge walls, thereby increasing the ratio to nearly 100 to one with the result of a 23 percent saving in fuel. This is a matter of record which a story may be published in a later issue.

Relative to bridge walls, I think it would be well to mention that the installation of modern ventilated bridge walls has been found to increase the boiler's efficiency. They also eliminate the labor of frequently rebuilding the brick bridge walls.

The present system of fitting tube retarders should be eliminated and the short grate bar fitted instead, getting the benefit of a high initial and a low terminal temperature which we now aim at but do not get with the retarders. Space at present does not permit me to go into the theory of combustion but it is hoped that this matter can be taken up at a future time.

SOOT BLOWERS A HELP

One of the modern practices which adds to the efficiency of the boiler plant is the installation of soot blowers, many types of which are excellent and a great many of which are useless. When soot blowers can be fitted to the back ends to blow with the draft they are of considerable advantage but where fitted as front end blowers they have a tendency to back up the products of combustion at the inside or further ends of the tubes and to reduce the efficiency of the boiler by plugging up the tube outlets. This is especially so when tubes are fitted with retarders.

In boilers fitted with the Howden forced draft system it is very often the practice to bank the fires too high when firing, using the upper air check over the furnaces. This is a bad practice. Fires should be carried light and even. Furnaces should be charged at short intervals and the doors closed as quickly as possible after the charging is performed.

Another evil that exists and seems to be inherited from ancient times is the promiscuous use of the slice bar. This tool in a well regulated and well organized fireroom is never used except in cleaning out fires. Of course, common sense

ought to teach even the least efficient firemen that they must keep their ash pans clear in order to prevent burning out grate bars and to allow enough air to consume the fuel.

INSULATION

All boilers should be thoroughly insulated. The best material for this is an 85 percent magnesia block fitted over a coating of chicken wire which leaves a dead air space. The whole should be covered with plastic cement and either lagged with a sheet iron covering or covered with a modern high class cement such as "Thorkote," which has given excellent results. All pipes should be thoroughly insulated

moving the bonnets, repacking the stems when found necessary, grinding valves in when same are found to seat poorly and putting same in good condition. A great deal of efficiency is lost by leaking valves in a steam plant, a fact that is especially true in marine work.

Fusible plugs are renewed at every yearly boiler inspection and steam gages calibrated at that time. While our steamboat inspection laws are sometimes considered too rigid there are two rules which are certainly correct, one is the installation of fusible plugs and the other is the drilling of staybolts. These screwed stays that are fitted between the combustion chamber and the shell of a boiler or between



Fireroom, Showing Method of Firing at Sea

with a magnesia covering. This comes molded in forms up to as large sections as will probably be used in any marine work. These sections should in turn be covered with canvas of double thickness, usually a No. 6, sewed in place. It should be added that all flanges should be covered with a special shaped covering made in halves, made removable in order to remake joints or set up on bolts when necessary.

Boiler water gages should be tested every day at sea and overhauled at intervals of at least once per month.

BOILER MOUNTINGS

Surface and bottom blows should be overhauled at stated periods not exceeding 60 days. This also holds good for water column valves, tri-cocks, gage glass fittings, main steam stops, auxiliary steam stops and last, but not least, whistle valve connections. These valves should be taken apart by re-

combustion chambers are drilled with 3/16 inch diameter holes to a distance of 1/2 inch within the sheet. This is done in order that the breaking of a stay may be discovered, water running out of the hole. One of the ex-German vessels operated by the United States Lines had the German staybolts in her boilers which were of a solid construction drilled to conform to the United States local inspectors' rule and the chief engineer on filling his boiler the first time found 15 staybolts were broken inside of the shell. This would not have been detected if the bolts had not been drilled. It is believed that in time this law will be enforced in European countries.

BOILER CLEANING

All boilers should be thoroughly cleaned inside and out at regular intervals. The external cleaning, as a matter of

routine, should be performed at every terminal port; internal cleaning should be performed at dates not exceeding 60 days. The modern ship is usually fitted with air compressor, and the use of pneumatic tools such as valveless scalers, etc., greatly assists the crew in performing this work. The use of compound is still a bone of contention but the engineer who uses clean water, kept slightly alkaline, is on the safe side. This can be determined either by the use of testing kits now supplied at reasonable prices or by reverting back to the old fashioned system of using litmus papers which will turn blue when the water is alkaline. This is a good practice and boilers are perfectly safe when the water is kept clean and slightly alkaline.

Care should be taken to see that all up-takes, breechings and connection doors, etc., are absolutely tight, as leaks here may lead to secondary combustion. This, however, should be followed up by the use of a gas analysis instrument.

RECIPROCATING ENGINES

Throttle valves on main engines should be kept steam tight, free and in good working condition. In reciprocating engines where a governor is fitted, this apparatus should be given periodical inspection and an overhauling at least every six months.

Considerable loss of steam is caused in many engines by the type of piston rings fitted to the high pressure cylinder. This cylinder, on account of taking steam from the boiler direct, is subject to greater heat and pressure than any of the others and special rings should be fitted to take care of this. For cylinders 24 inches in diameter and under a solid plug has been found very efficient. This should be fitted only when cylinder walls are true and they should be made large enough to travel over the counterbore so that when wear takes place another can be fitted and the cylinder walls kept parallel. Above this size, however, it is dangerous to fit the plug type close enough to be economical. The common snap ring does not give satisfaction at the temperatures and pressures now used for marine work of 200 pounds per square inch and over on account of the steam getting behind the ring and forcing



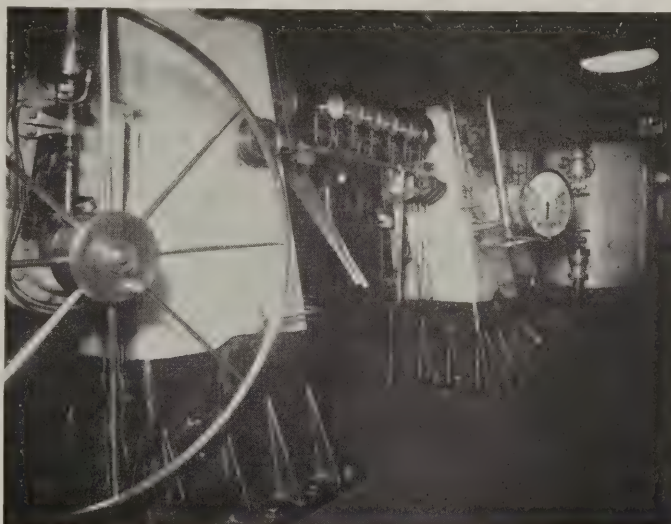
Sampling the Flue Gases with Orsat Apparatus

diameter of the cylinder. This gives a tolerance of 15/1,000 or approximately 1/64 inch in a 30-inch cylinder.

In cylinders of lower expansions snap rings usually work satisfactorily if made of the correct sections and proper material. It has been found, however, in the case of the low pressure cylinder on condensing engines that due to the pull of the vacuum it is necessary to fit a ring with considerable tension or to fit springs to keep the ring against the walls of the cylinders. Lockwood, Carlyle and rings of this type have proved very satisfactory in low pressure cylinders.

The care and up-keep of the valves in a reciprocating engine means much to the economy of the machine. High pressure valves are usually of the piston type and should be kept as nearly steam tight as possible. It has been found practical to have these renewed when a tolerance of over 6/1,000 takes place due to wear.

The intermediate valves should also be kept tight and the low pressure which is usually a slide valve should be examined at periods not to exceed three months and care should be taken to see that grooves or slots are cut in valve and seat to allow steam to penetrate for the lubrication of the surfaces. These slots or grooves should be kept clean and where relief rings or other means are fitted to the back of the valve to relieve the pressure they



Working Platform. Throttle Valve Is Shown Near Telegraph Dial That Communicates With Bridge. Feed Water Heaters in Background

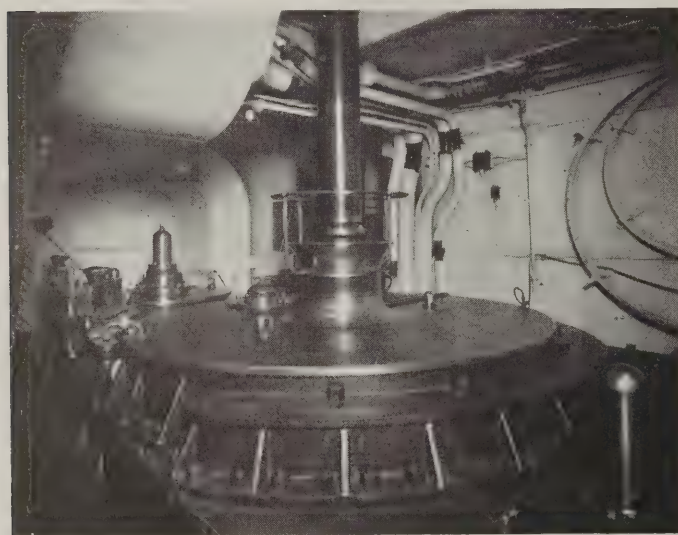
should be kept tight and in a good working condition so that undue pressure will not occur on the valve seats.

The setting of valves is determined by the indicator cards and this should be followed up constantly so that the valves may be kept in a correct position to give a well balanced and efficient engine. Cut-offs should be adjusted to distribute the load equally throughout the different cylinders.

In many vessels, especially those in which forced draft fans are fitted in the engine room, it is found that considerable condensation takes place in the cylinders due to the cold air bath caused by air flowing from skylights. In these instances portable mats should be fitted over cylinder covers to retain the heat as much as possible and reduce radiation.

PACKING

Piston rod packing is another very important material that is used in marine engines of the reciprocating type. With saturated steam the ordinary type of packing with pressure



Low Pressure Cylinder, Showing Dome Fitted Over Tail Rod to Avoid Fitting Packing and to Eliminate Oiling. Vacuum Was Increased 1 Inch by This Change

breaker can be fitted if made of a suitable brand of white metal usually with a large percentage of lead on account of the temperature caused by the steam and friction. However, with superheated steam the packing is more of a problem and pressure breakers and wearing rings for the high pressure are made either of cast iron or composition metal, or a combination of both. In the fitting of cast iron the utmost care must be taken as to the composition and texture and the manner in which it is fitted. Unless unusual care is taken in this the result will be scored rods and a failure of the packing. Examination and overhauling should be done at periods not exceeding six months. Care must be used to see that wearing rings float, in other words, work freely against piston rods and that all joints are tight.

The old fashioned system of fitting packing to tail rods has been pretty well eliminated and the latest method is to fit domes over these rods thereby eliminating the use of packing. This method keeps the cylinder covers clean.

On large units, such as the main propelling engines, it is not considered good practice to fit packing with split joints, on packing boxes or gland. One reason is that it is almost impossible to fit a wearing ring to the rod and to the split gland at the same time. There is also the leakage of the joint in the way of the split.

OVERHAULING METALLIC PACKING

When dis-assembling packing, care should be taken to see that the wearing rings do not butt on the ends but are

allowed approximately $1/32$ of an inch clearance to take up for wear and to allow the metal of wearing rings to form a joint by close contact with rod and with the container on which they rest.

In the case of soft packing for auxiliary machinery, where it does not pay or is not feasible to fit metallic packing, care should be taken that a pure asbestos packing is not fitted to a running rod as the asbestos has a very bad effect on steel and will eventually wear grooves in the rod which means renewal in a short length of time. Some good wearing packings contain asbestos but always in conjunction with metal, that takes the wear against the surface of the rod.

BEARINGS

The fitting of bearings is a matter of routine work and should be laid out on a schedule where all bearings will be taken care of between every 60 and 90 days according to the need for same; this is usually determined by the amount of wearing surface allowed by the design of the engine. A great deal of undue wear is caused by neglecting the cutting of oil grooves and clearances, which is a very important matter and is usually not given attention. The crosshead brasses are usually the first to suffer through this negligence, and the average engineer forgets that his greatest difficulty is to get the oil on the top of the pin and keep it there, which is best done by cutting grooves to keep oil on top of the pin, allowing means for air to escape, and not by running the oil off the top and side of the pin. It is safe to say that the average engineer will reduce the best part of his wearing surfaces 20 percent by cutting improper oil grooves.

When the condition becomes acute and the bearings carry undue heat from this cause the shaft should be raised and either all bearings remetalled or at least those giving trouble should be filled and machined to size and thickness to conform to adjacent bearings.

A bridge gage is usually fitted to each engine and this should be used on main engines at intervals of about six months to determine the wear and alinement of the main crank shaft. The wearing down of the shafts usually does no particular damage other than to cause the shimming up of valves and connecting rods to keep pistons and valves in proper position, unless the wear takes place at certain points. This condition then becomes dangerous due to strain thrown on the crank shaft, bed plates, and reciprocating parts of the engine due to the lack of alinement. When the bridge gage shows undue or uneven wear on main bearings the coupling bolts on crank shaft should be removed and alinement checked by measurement of coupling flange. The proper adjustment of bearings is usually made by allowing a rule of thumb of $1/1,000$ of an inch tolerance to 1 inch diameter of shaft over ranges from 2 to 10 inches in diameter. Above this diameter it is usual to allow less clearance, which can be determined better by the action of the engine.

CARE OF BEARINGS

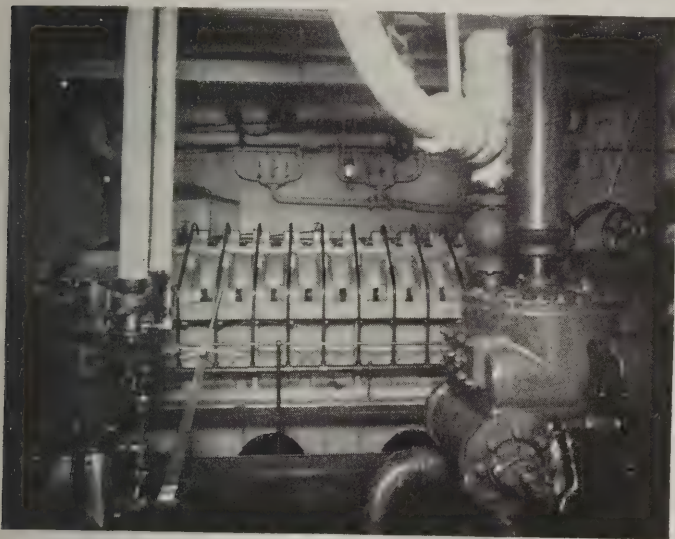
Care should be taken in the fitting of main bearings and also of crank pin and crosshead bearings to keep the brasses well up around the journal. A very bad practice that a great many engineers are guilty of is to ease off the sides with the idea of keeping the bearing running cool. This is a fallacy and is not practiced in up-to-date work.

Bearings need a slight clearance on the sides. This is usually arrived at by fitting the parting pieces so that the bear only on the ends and cut away in the center. This space acts as an oil-well and gives all necessary clearance for the carrying of oil, etc.

When arriving at the proper clearance or making adjustments on bearings lead wire is used between the shaft and bearing to ascertain the space between shaft and bearing. Care should be taken to use the proper sized lead, which should be slightly larger than the clearance required for

top of bearing. The leads are usually placed about 6 inches apart. When lead wire of too large a diameter is used and when placed closer together than mentioned above a false impression is taken so that when the leads are removed and the bearing put back it very often fits much closer to the shaft than the impression on the leads would indicate.

Where space is available feelers or thickness gages should be used which in the case of crosshead bearings very often



Main Thrust Bearing. Turning Engine Shown at Left and Sanitary Pump at Right

eliminates the necessity of stripping these bearings and using lead wire to get the clearance. The engineer must always watch the adjustment of his bearings, first to see that they are not too tight, which may cause heating and serious damage. He also should see that clearances do not become too great, for this is apt to cause a hammering effect by the journal shaft or pin, resulting in a loss of oil. The metal in the bearings is then apt to crystallize and if engine is allowed to continue for an undue length of time serious results are sure to follow, usually a broken shaft or pin.

THRUST

The thrust bearing fitted to this type of machinery is usually of the horseshoe type. These horseshoes are steel collars filled with white metal and should be kept clean and adjusted both as to tolerance and as to position as wear takes place by the thrust of propeller in driving the ship. Care must be used to keep the shafts set back to compensate for this wear in order to keep the crank shaft in alinement with the cylinders, piston rods, connecting rods, etc. The tolerance of these rings ranges from 4/1,000 to 15/1,000 of an inch according to the size and power of the engine.

The line shaft bearings which perform the function of holding up the shafting between the thrust and propeller shaft usually require little attention other than oiling excepting at intervals of two years when the tail shaft is removed for inspection to conform with rules set down by the classification societies and steamboat inspectors.

When a bearing of this description does cause trouble, usually by losing its white metal, through overheating or undue wear, it is usual to break the couplings on the shafts supported by this and adjacent bearings and then the metal is renewed and the shafts are lined up by comparison with the flange couplings fitted to each shaft.

Tail or propeller shafts are usually made of a high grade steel covered with bronze liners to keep out the sea water. These shafts run on lignum vitae bearings made by fitting wood of this kind on edge. They are bored to the same or a slightly larger diameter than the shaft, usually allowing 1/16

inch to the foot for clearance, which also allows the sea water to flow in and keep the shaft cool and lubricated while in motion. Many shafts are fitted with patent stern glands intended to hold lubricating oil in the stern tube but few are successful.

CONDENSERS

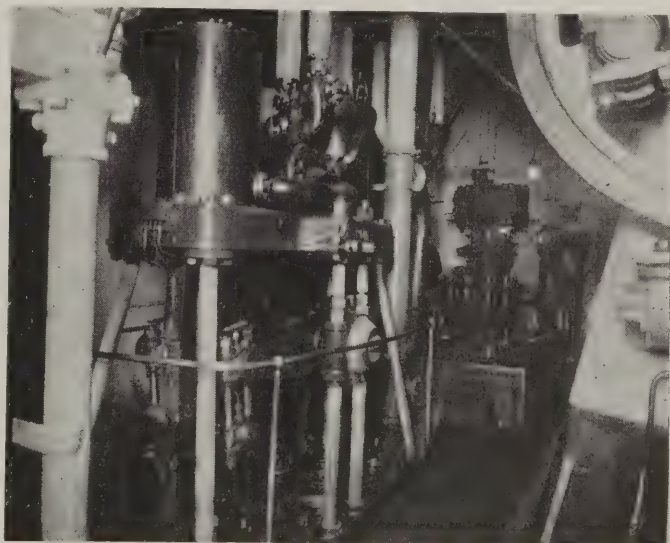
The condenser is usually a vessel constructed with a cast iron shell having a water box of the same material on each end and taking sea water at one end from a centrifugal pump. The water then passes through one-half of the tubes and returns from the opposite end of the condenser through the other half and is then forced overboard. A division plate is constructed to fit between the incoming and out-going water at one end and care should be taken that periodical inspection is made at every terminal port to see that this division plate is tight and in good condition. Many serious accidents to marine engines have been traced through the loss of this division plate at sea.

Fitted over each end between the water box and shell of the condenser there is a heavy brass sheet perforated to receive the condenser tubes. These tubes are usually $\frac{3}{4}$ inch in diameter (for commercial use) with length to suit the various condensers on the different ships. Holes in the tube sheets are first drilled to a diameter suitable to receive the tubes and then counterbored and threaded to receive packing to make a watertight joint around the tube and keep the sea water from mingling with the condensate.

In early days wooden ferrules were used for the purpose of making tight joints between tubes and sheet but of late years packing of different materials has been fitted around the tubes and compressed and made tight by the use of a ferrule screwed into the threaded gland, forcing the packing against the tube and against the shoulder in the tube sheet to form a water and air tight joint.

AIR PUMPS

After the water is condensed and falls to the bottom of the condenser it is then removed by an air pump and delivered



Air Pump in Foreground, Filter Boxes and Ballast Pump in Background

into the hot well. The air pump is a specially built apparatus which not only removes the water but also creates a vacuum by removing the air from the condenser. It assists the efficiency of the main engine by relieving the atmospheric pressure, which would otherwise operate against the low pressure piston.

(To be continued)

Oil Burning Affords Great Opportunity for Economy

Secret of Efficient Combustion Lies in Maintaining Proper Adjustment of Oil and Air for Twenty-four Hours of Each Day

By J. S. Milne*

THE keen competition that confronts the shipowner today has decreased the margin of profit and resulted in a demand for increased economies. Fuel is the most expensive item in ship operation and it affords a great opportunity for practical savings.

Many marine engineers think that all they have to do to burn oil efficiently is to turn on the oil and give it sufficient air to prevent heavy smoke. When asked to explain the high consumption, they invariably blame the equipment and are surprised to find that by applying a few of the principles of combustion to general practice, a substantial saving will be effected.

It is not the fault of the engineer for failing to obtain good results if his apparatus is not designed to give all the adjustments necessary for the proper control of air and oil, in order that complete combustion can be obtained with a minimum amount of air.

Complete combustion with a minimum amount of air is the secret of efficient oil burning. It cannot be obtained by judging the appearance of the flame in front of the furnace or the amount or color of the smoke from the stack, but by systematic use of instruments that are designed for determining the results to be obtained. Each fire should be adjusted individually, where it is possible, to give at least 12 percent CO_2 and all the others balanced with the same size tip on each burner and an equal distribution of air so that any variation in power can be obtained by increasing the oil pressure and the air without separate adjustment at each burner.

IMPORTANCE OF GOOD ATOMIZATION

The mechanical burner is the most generally used in marine practice. The oil is heated well above its flash-point and forced under pressure through the burner. The tip and atomizer give it a whirling motion causing the oil to break up into very fine particles entering the furnace in a hollow-shaped spray. The air for combustion is admitted around this hollow cone of oil. On an ordinary job it is seldom necessary or desirable to force air into the fire with sufficient velocity to pierce this cone-shaped spray of oil and still retain sufficient oxygen in the air to support combustion on the inside of this cone of oil. Assuming that it is only necessary to get the air that supports combustion in contact with the outside of the oil film, it will readily be seen how important it is to have good atomization with a real hollow cone and no oil issuing from the center into the furnace parallel to the walls, otherwise a higher air pressure is required with a lowering of efficiency.

The burners are usually designed with air registers, some of which give the air a circular or twisting motion and others a rolling motion. The real purpose is to get the proper amount of air in contact with the particles of oil as quickly and completely as possible, effecting combustion at the front of the furnace, care being taken to cut down the air supply to the minimum. When the job has been properly balanced and all the air adjustments made, it is necessary to maintain this condition continuously while operating. Steam requirements often vary, especially on passenger vessels, requiring the burning of more oil or the lowering of the pressure to suit different conditions of weather and requirements, thereby up-

setting all of the adjustments. Under these varying conditions, the use of accurate recording instruments helps the engineer to maintain an efficient system of operation and also keeps the chief engineer in touch with the performance of his juniors, having at all times a record of the condition under which the plant has been operating.

RECORDING INSTRUMENTS

There are a number of recording instruments for this class of work on the market, the most important of which are as follows:

- CO_2 recorder for stack analysis.
- Recording draft gage for air pressure.
- Recording stack pyrometer for temperature of escaping gases.
- Recording thermometer for temperature of fuel oil as supplied to the burners.
- Recording pressure gage for pressure of fuel oil supplied to burners.

The CO_2 machine is the most important and this should form part of every engineer's equipment as the use of this instrument is becoming more important each day. The recording instruments indicate immediately the changes occurring in operating conditions and permit the engineer to make the proper corrections at once. With this knowledge of conditions so readily obtainable, uncertainty and guesswork are eliminated, and the records obtained are a good check on the combustion performance and should be turned in with the log at the end of each voyage.

We have recently fitted a steamer with apparatus for regulating the amount of air required in accordance with the amount of oil burned on forced draft oil burning installations. The variation in oil pressure is controlled by a very ingenious arrangement for automatically regulating the air pressure, that is, if more steam is required, the governor on the oil pumps is set at a higher pressure. This automatically speeds the blower and keeps the supply of air regulated. This apparatus will effect quite an increase in operating efficiency as it does mechanically what we have been allowing unskilled firemen to do. However, it requires careful adjustment at the start and an interest on the part of the engineer force in its automatic operation.

Summarized, economy in oil burning necessitates the proper adjustment of the oil and air in order that the results can be as near to perfect combustion as possible and this condition should be maintained for 24 hours each day.

The economies resulting from the efficient burning of oil, while increasing the profit of the shipowner, must also be considered as an important factor in the conservation of our oil supply.

SHIPPING BOARD WAGE SCALE ADOPTED.—At a special meeting of the member companies of the American Steamship Owners' Association, held on April 23, it was voted that the official wage for unlicensed personnel in deck and engine departments of the American Steamship Owners' Association, effective at once, be the same as that now in effect on Shipping Board vessels, and that members be urged to subscribe to this wage and absolutely live up to it until same is changed by action of the Association in conference with accredited representatives of the Shipping Board.

*Chief Engineer, Todd Shipyards Corporation.

Meeting Competition by Using Superheated Steam

Operating Efficiencies and Costs of Superheated Vessels Compared with Those Using Dry Steam or Diesel Engine Drive

By Henry B. Oatley*

"I HAVE been shipmates with *saturated* steam for twenty years and see no reason why I should use superheated steam in our ships now." This statement was recently made to the writer by an official connected with a large steamship line operating under the American flag. Much can be read between the words quoted and much more can be said as to the effect upon our merchant marine of backward-looking attitudes of this nature, particularly in this day of high fuel and operating costs.

Competition will always be with us. If it is not offered by ships under other flags, it will be offered by ships under the American flag. When our competitors advance, we must advance further. If they save fuel, we must save more. If they decrease operating costs, we must lower ours an even greater amount.

In ship design and construction there are many factors which contribute to success or failure in the operation of that vessel. Many of the errors which may have crept in cannot be corrected except at prohibitive costs. This condition might be the result of errors in design of hull, which affect either speed, stability, or costs of handling cargo in or out of the ship. Many of these handicaps are capable of being removed at relatively small cost and can be made the means of turning losses into profit. Conditions of this kind are frequently to be found in the construction of boiler room or engine room equipment, methods for handling or burning fuel, and in the efficiency with which the energy in fuel is transformed into propulsive effect.

In this range of conditions the use of superheated steam stands out prominently. The contrast in thermal efficiency between saturated and superheated steam operation is well and favorably known. In all fields where steam-driven prime movers are utilized, superheated steam has become of widespread use, but it is remarkable that in marine service its general adoption has lagged somewhat behind railway and industrial power plant applications. During the last ten years, however, marine engineers have turned to superheated steam in increasing numbers as one very effective means of reducing fuel costs and thereby increasing net operating income.

Our American ships are, to a large extent, still operating inefficiently with saturated steam. It is true that during the war the Shipping Board Emergency Fleet Corporation gave some rather indefinite attention to the use of moderate degrees of superheat, but unfortunately the position of the board in this matter was hardly abreast of the development reached by other nations with large merchant fleets. The

large proportion of our ships which had been specified to use moderate degrees of superheat were, under the stress of war-time operation, operated with steam little more than dry.

NEED FOR IMPROVEMENT IN BOILER EFFICIENCY

Whatever may have been the reasons and the necessity for this, it is clear that we now must reconsider the situation and adopt all means that have been found effective in reducing the annual expense of ship operation, and which contribute to more revenue-paying ton-miles per year per dollar of operating cost. The time has now arrived when prejudice and old-time views must be brought out, placed on the table

and again analyzed in the light of present-day practice.

The arguments for and against the use of superheated steam have been so frequently discussed at much length in the engineering press that it is not considered necessary to again bring them into this article.

RESULTS TO BE GAINED FROM USING SUPERHEAT

The results, in economy of operation, perhaps have been given less prominence, and it is felt that reference to this "sine qua non" of the question should be gone into in some detail.

What has prompted large and well-managed steamship companies, such as the Cunard, White Star, Ellerman and others in England; the Compagnie Generale and

Mesagaires Maritime in France; the Nippon Yusen Kaisha in Japan and the Luckenbach, Ore Steamship Company and others in the United States, to install superheaters? It surely is not because owners desire to spend more money on their ships or to make any addition to already well-filled engine or boiler rooms. It is not because they are desirous of experimenting, nor is it because their passenger vessels can be advertised as providing additional comfort for passengers. It is because they have found from their own experience, which checked the results obtained by competing lines, that there were advantages represented by decreased fuel cost, increased revenue-paying cargo and, in many instances, because less space was occupied by the boilers to obtain the required capacity and because when coal is used as fuel there is a reduction in fire-room labor, with a consequent preference on the part of fire-room personnel for ships using superheated steam.

A list of all notable examples of vessels, wherein part or all of these advantages have been demonstrated, would read like a page from the Register of the American Bureau of Shipping. The *Homeric*, *Scythia*, *Carmania*, *Tyrrhenia*, *Empress of Asia*, and *Columbia*, among passenger ships; the *Bolton Castle*, *Kandahar*, *Adrar Baoule*, *Eclipse* (and other

Comparative operating records and trials indicate that increasing the superheat will increase the efficiency and give added fuel economy.

An increase of 50 degrees in superheat will give the same economy as an additional one-half inch in vacuum.

An increase of 50 degrees in superheat will give greater economy than an additional fifty pounds in boiler pressure.

Increasing the degree of superheat is far less expensive than providing for increased vacuum or increased boiler pressures.

*Vice-president, The Superheater Company, New York.

vessels of her class) the *Chilore* and *Marore*, and many other cargo vessels on the deep seas; also many hundreds of boats operating on lakes, rivers and canals could be named, all of which are using steam superheated above 500 degrees F. Most of the 3,000 vessels fitted with superheaters, not including our war-built merchant marine, use steam at 600 degrees or upwards.

Executives of steamship companies upon whom the responsibility for operating results may rest, are not so much interested in the number of ships equipped with superheaters as they are in the results obtained. They are interested only in whether or not they may be assured of:

1. Continuity of service.
2. Freedom from additional risk at sea.
3. Reduction in operating costs.
4. Cost of maintenance.

FEATURES OF SUPERHEATED SERVICE

Continuity of service is in no way jeopardized by the use of superheated steam, when apparatus of a proper design is fitted under proper supervision and operated with the same care and attention given to other equipment in the engine or fireroom. Like every other appliance aboard ship there have been instances of proper design installed under improper conditions, or of improperly designed apparatus, which have not given the full measure of satisfactory service. The widespread use of superheated steam in marine and other service should reassure the timid, or hesitant, executive, that suitable equipment is available and that the expected results can be obtained.

Freedom from additional risk at sea never has been seriously questioned, although it sometimes is referred to as "requiring proof." Many vessels on their maiden voyages have encircled the globe without a moment's delay, or a penny spent on repairs, and without a trace of any indication that the ship was at any time in danger. Important apparatus aboard a ship has to meet the requirements, and pass the inspection, of one or more official classification societies, or government inspection bureaus.

Reductions in operating costs are of greatest interest and most value when summarized. In Table I are given the total operating costs, showing the reduction by the use of superheated in place of saturated steam. A reciprocating engine vessel utilizing saturated steam has been used as a basis. This vessel was described in MARINE ENGINEERING AND SHIPPING AGE, March, 1923, page 138, with corrections of what appear to be typographical errors. With the use of 200 degrees of superheat a reduction in total operating expense, inclusive of a 10 percent return on the investment, of \$4,045 annually is shown.

TABLE I

	With Saturated Steam	With 200 Degrees F. Superheat
Total capital charge (29 percent)	\$70,800	\$73,660
Fuel used at sea and in port	95,000	85,240
Lubricating oil and make-up feed water ..	4,035	3,930*
Wages of crew	37,500	37,500
Subsistence	8,500	8,500
Tonnage dues and port charges	32,350	32,350
Brokerage and management	42,750	43,530
Stevedoring of cargo	119,700	121,880
Total operating expense	\$410,635	\$406,590

* 5 percent additional allowed for lubricating oil.

If the figure of \$412,000 in the reference referred to is correct, the saving would be \$5,410 annually. This reduction in operating cost would be obtained for a capital expenditure of not more than \$10,000 assuming that it was a superheater installation made in an existing vessel. The investment would be less, if the superheaters were installed when the vessel was built. Surely an annual return of upwards of 45 percent of the investment cannot be lightly disregarded.

In the comparison shown in Table I, no credit is taken for additional revenue-cargo permitted by a reduction in weight of make-up feed water and fuel required. This reduction amounts to 150 tons per voyage. An additional 150 tons of revenue-producing cargo per voyage yields (at \$4.50 per ton) an income of \$6,815 per year. This, added to the saving in operating cost, will more than repay the cost of superheater installation during the first year.

COMPARISON OF SUPERHEATED STEAM VESSELS AND MOTORSHIPS

The relative operating costs of, and investment in, motor driven and steam driven vessels has been widely discussed in the last few years. One of the most recently published,* and perhaps the most carefully worked out, comparison was contributed by Lawrence B. Chapman, professor of naval architecture, Lehigh University. The analyses were brought down to a basis of the "cargo rate to earn operating expenses and to pay a 10 percent return on the investment." It was shown that under the conditions assumed a Diesel engine driven ship, with steam auxiliaries and a geared turbine job with 100 degrees of superheat would, on a 5,000-mile voyage, be on a par with cargo rates at \$4.54 per ton. On a 10,000-mile voyage the Diesel drive would have an advantage over the geared turbine ship.

In the comparison referred to, 100 degrees of superheat was assumed for the turbine ship and only saturated steam for the reciprocating engine drive. Just why both steam driven vessels were placed on such a basis was not made clear. Believing that the hundreds of vessels operating satisfactorily for years with highly superheated steam justifies the assumption that the steam driven vessels in the comparison could be made much more attractive in operating costs, such calculations have been made. The two steamships in the article above mentioned have been figured through, using the same assumptions, general data and formulæ as used by Professor Chapman, but 200 degrees of superheat have been taken.

Using the same formulæ for steam consumption per shaft horsepower or indicated horsepower hour the 100 degrees increase in superheat for the geared turbine vessel results in a 7.4 percent steam saving; while the addition of 200 degrees of superheat on the triple expansion vessel gives a 15.2 percent steam economy.

Boiler efficiency, of course, is improved because of the increased amount of heat-absorbing surface, which causes a reduction in the waste-gas temperature of from 50 degrees to 100 degrees. The boiler efficiency in the turbine-driven vessel will become easily 72 percent instead of the 70 percent assumed by Professor Chapman. In the triple expansion engine job, where 200 degrees superheat is added, a boiler efficiency of 74 percent instead of 70 percent will be obtained from the Scotch boilers when fitted with firetube superheaters. These efficiencies, when used in the calculations for fuel economy, show 5 percent and 12 percent savings for the turbine vessel and reciprocating engine vessel respectively, and will check closely with the service results obtained from a large number of vessels.

In making the correction for the increased degree of superheat, arriving at the figures given in Table II, allowance has been made for the increase in weight due to the superheaters and for the cost of the superheater application and its installation.

THE HIGHER THE SUPERHEAT THE HIGHER THE ECONOMY

The efficiency ratio used by Chapman will be increased by the increased degree of superheat, because the benefits measured by reduced steam and fuel consumption per horsepower hour exceeds the calculated and theoretical figures based on temperature-entropy analysis. This increase, in

* MARINE ENGINEERING AND SHIPPING AGE, March, 1923.

the case of turbine engines, is partly the result of decreased windage losses and, in the case of reciprocating engines, partly the result of decreased valve and piston leakage. The efficiency ratio, therefore, for the turbine powered vessel has been changed from 0.62 to 0.63, and for the triple expansion engined vessel from 0.575 to 0.60.

By making the proper corrections in the items given in Tables I, II and III,* we find that the rate per ton of cargo necessary to give 10 percent return on the investment in addition to direct operating charges will, for the four ships, be as given in Table II.

TABLE II

Type of Propelling Machinery	Superheat, Degrees F.	Rate per Ton of Cargo to Give 10 Percent Return on Investment 5,000-Mile Voyage
Geared turbine	200	\$4.50
Diesel (steam auxiliaries)	...	4.54
Triple expansion	200	4.67
Diesel (electric auxiliaries)	...	4.82

The beneficial effects from an economy standpoint by running at low vacuum are well known, and are quite generally appreciated. The advantages of increasing the degree of superheat, however, assuming that low degrees of superheat have been used, are very well established, but are not so generally appreciated. On a number of recent investigations, the purpose of which was to determine the economies in fuel and in operating cost, these factors were analyzed in considerable detail. It was shown, for example, that the same additional economy in daily fuel consumption was obtained from an increase of superheat from 150 degrees to 200 degrees, as was obtained by increasing the vacuum from 27½ inches to 28 inches. Also that to raise the superheat from 100 degrees to 200 degrees resulted in a greater fuel economy than increasing the vacuum from 27½ inches to 28½ inches. The difficulty in constantly maintaining high vacuum is well known and many ships, particularly those operating in tropical waters, lose more than 1 inch of vacuum compared with their operation in the higher latitudes. In these comparisons a boiler pressure of 300 pounds existed. For lower pressures the same relation would exist between increased superheat and increased vacuum, although the percentage economy in both cases would have been higher.

The thermal advantages and consequent fuel economies with higher pressures also have been well recognized, but the gain from increased degree of superheat in comparison with the gains from the higher boiler pressures have been given less publicity. With a vacuum of 28.5 inches, 250 pounds boiler pressure and 150 degrees of superheat, the comparison shows that by raising the degree of superheat 50 degrees a fuel economy of 1.9 percent is obtained; while by increasing the boiler pressure from 250 to 300 a saving of 1.8 percent in fuel consumption is accomplished. It is admittedly less expensive in the first cost to increase the degree of superheat than it is to provide for higher boiler pressure, but it also is clear that both ways of effecting a reduction in operating cost should be given careful study.

The amount of superheat carried is independent of these conditions, and indicates one reason why continued and uniform economy from the use of the higher degrees of superheat is assured.

KEEPING SUPERHEATERS IN SERVICE

The cost of maintenance is difficult to state in definite terms, unless there be a very full description of the conditions existing. These conditions vary with the class of ship, character of service, ports touched, fuel used and last, but not least, personnel of the ship and policy followed by the steamship company as to maintenance and repairs.

Maintenance cost due to the use of superheated steam is as variable as repairs to other boiler and engine-room equipment. Information obtained from the owners of ships operating with high degrees of superheat shows that maintenance costs are not increased on the basis of total investment due to the use of highly superheated steam. A figure of 6 percent on the investment in the equipment will very fairly cover the annual repair, maintenance and overhauling due to the use of highly superheated steam. The maintenance cost included in Table I has been increased \$600 for the use of the superheaters. This is considered high when these costs taken from the records of many ships over a period of years are known.

In conclusion, it does not seem that the owners of American ships, faced as they are today with the necessity of scrutinizing operating conditions which include not only higher wages, but the very unstable condition of purchasing or building of vessels, can afford to disregard the advantages of all factors which are successfully utilized by their competitors operating ships under other flags.

The Diesel, in comparison with steam engine, is receiving very careful study, and the operating results of such ships will be a matter of vital importance. There is, however, ample evidence to support the contention that the steam-driven vessel—admittedly capable of very great improvement—is superior under many operating conditions to a ship propelled by internal combustion engines, and in this contention the further improvement of the Diesel or semi-Diesel engine is not disregarded. The geared turbine or the turbo-electric-driven ship with high degrees of superheat, and with higher boiler pressures, has proven, in the recent past, and without much doubt will continue to demonstrate, its advantages for the powering of our ships.

Plaintiff's Rights in Limitation Suits

WHERE the plaintiff in a limitation suit has settled claims abroad, arising out of a collision in respect of which the decree of limitation has been obtained, he is entitled to bring payment of such claim into consideration before the registrar when the administration of the limitation fund is decided upon. Proof of such payment may be brought before the registrar notwithstanding that such payment was made under a foreign system of limitation, or for an amount not limited according to the English rule of limitation. It is not material that the claimants to whom such payment was made were not subject to the jurisdiction of the Court.

The steamer *Dokka* and her cargo were sunk in collision with the steamer *Coaster*. After the collision the *Coaster* put into a French port, where her owners were forced to give bail in order to secure her immunity from arrest at the suit of the owners of the *Dokka*. Bail was given in an amount equal to the value of the *Coaster* at that time, which was the full amount of the liability of her owners under the law of France. In subsequent proceedings in France the *Coaster* was held alone to blame, and her owners were condemned in the amount of their bail and costs. The owners of the *Coaster* discharged the judgment debt and then commenced proceedings to limit their liability in England. A decree of limitation was pronounced and at the subsequent reference a claim was filed by the owners of the cargo laden on the *Dokka* and the owners of the *Coaster* themselves also filed a claim for the amount they had paid under the judgment in France, together with their costs in the French proceedings. The registrar allowed their claim for the amount paid to the owners of the *Dokka*, i. e., the amount of the statutory liability of the owners of the *Coaster* in France. The English Supreme Court of Indicture in Admiralty held that the claim was properly allowed. *Aspinall's Maritime Law Cases*. Vol. XV, Part VII, page 560.

*MARINE ENGINEERING AND SHIPPING AGE, March 23, 1923, pages 138 and 139.

How to Buy Fuel of Proper Quality at Lowest Price

By Major George M. Talbot*

IN the present era of low freight rates and high operating expenses the fuel bill, which usually represents from thirty to forty percent of the actual operating expenses in steamship operation, should be given first consideration in order to reduce its cost to the absolute minimum consistent with efficient operation of the vessel under consideration.

The most important problem is to procure fuel of a proper quality at all times at the lowest possible price.

In purchasing coal and oil, the purchaser should carefully study conditions affecting the market value of these commodities and endeavor to contract for requirements when the market value is lowest. While some purchasers of coal and oil prefer to take their chances on the open market or make

Study the market conditions carefully and buy right.

Buy on a long term contract and avoid the market fluctuations.

Be sure the quantity and quality of fuel you buy are actually delivered.

Keep your "burning equipment" in efficient condition.

Employ only competent and efficient engineers and firemen.

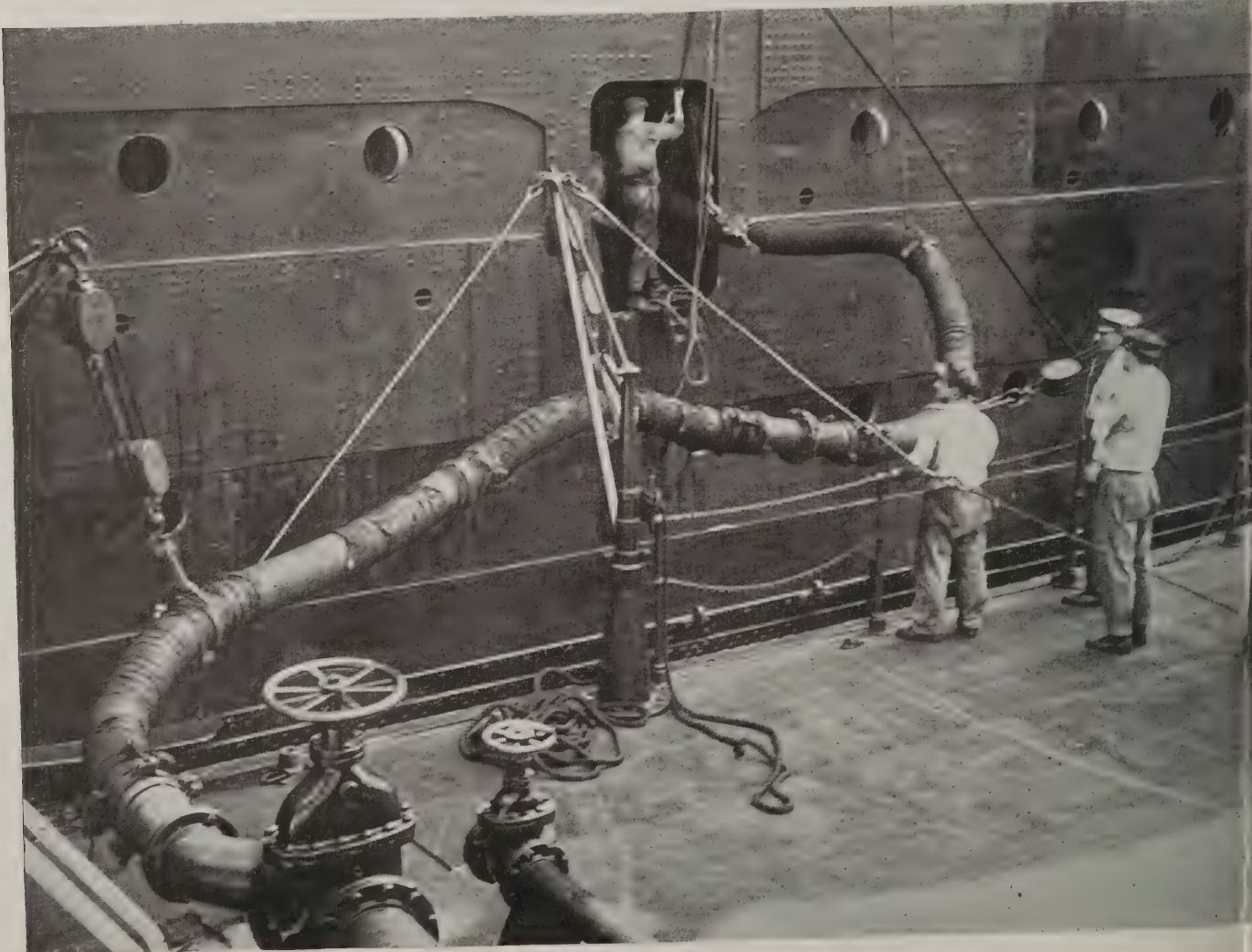
short term contracts, the writer prefers the long term contract covering one year or longer. By making a long term contract with a reliable supplier, who can guarantee performance, the purchaser will usually avoid the market fluctuations. He is thus enabled to undertake long time freighting contracts and know in advance what the largest single item of his operating cost will be.

FUEL OIL

The question of quality is an important one. In purchasing fuel oil the purchaser should consider using the lowest grade of fuel oil that his burners can handle efficiently, bearing in mind that if he demands too high a grade of fuel oil the refiner is compelled to leave some of the more valuable by-products of crude petroleum in the fuel oil, and, therefore, must obtain a higher price for this commodity.

A grade of fuel oil that the majority of vessels can handle

*Assistant manager, fuel department, United States Shipping Board Emergency Fleet Corporation, Washington, D. C., and member of Fuel Conservation Committee.



S. S. Aquitania Taking On 55,000 Barrels of Fuel Oil in 9½ Hours

efficiently, if the vessels' bunker tanks are equipped with facilities for heating the oil, is commercially known as bunker oil "C." This grade of fuel oil is considered the most economical fuel on the market today.

In producing this grade of oil the refiner is able to extract from the crude petroleum the lighter and more valuable fractions, leaving a residuum oil that is entirely satisfactory for use as fuel. The calorific value of the residuum usually runs about 2.5 percent less than the crude from which it is extracted.

POINTS TO SPECIFY

As a guide to the purchaser in preparing his specifications the following are the most essential points to cover in order to be assured of a proper quality of oil:

Flash Point. In order to comply with insurance regulations and minimize the fire hazards, it should not be lower than 150 degrees Fahrenheit, test to be made in a closed tester.

Water and Bottom Sediment. Water and bottom sediment in the oil should not exceed two percent.

Viscosity. The viscosity should not exceed 300 seconds at 122 degrees Fahrenheit, test to be made in the Saybolt Furol, Viscosimeter or equivalent results if test is made on other instruments.

It is not necessary to specify the number of British thermal units to the pound of fuel oil, for the reason that the fuel oils supplied by the principal oil companies throughout the world seldom vary more than five percent in British thermal unit value. This, however, is not the case with bunker coal whose British thermal unit value varies in different localities as much as twenty percent.

VISCOSITY SPECIFICATION MORE ACCURATE

Although it has been the custom in the past to specify an oil of a certain specific or Beaume gravity in order to determine one of the principal characteristics of the oil, i.e., its fluidity, a gravity specification does not determine this feature with sufficient accuracy, and, therefore a viscosity specification has been substituted which more accurately represents the nature of the oil.

A great many are of the belief that viscosity and gravity are closely related. This is not the case as evidenced by the following definitions of these terms:

Viscosity is a measure to determine the fluidity of a liquid, its internal friction or its resistance to flow.

Specific gravity as applied to liquids is the method used to determine the weight of a liquid and is defined as the ratio of the weight of a given volume of a liquid to the weight of an equal volume of fresh water.

Beaume gravity is another method consisting of the use of a hydrometer to determine the weight of a liquid.

As a further indication that these two terms are not closely related, it has been found that it is possible for a 16-degree Beaume fuel oil extracted from a naphthene base crude oil to have a greater viscosity and, therefore, to be more difficult for pumps to handle at a temperature of 100 degrees Fahrenheit than a fuel oil of 13-degree Beaume at the same tem-

perature, which was extracted from a paraffin, or mixed base crude oil.

Notwithstanding these facts which should be apparent to any student of the subject, some purchasers of oil still insist on a higher gravity specification when what they really seek is a lower viscosity.

BUNKER COAL

In purchasing bunker coal, some follow the custom of purchasing under a trade name or under a recognized classification, others purchase under an analysis specification, while still others make the mistake of purchasing almost any kind of coal that can be procured at the lowest price. There is no doubt but what it is more economical to purchase the highest grade of coal that can be procured, provided there is not too great a price differential.

The writer will not attempt to establish anything that might be considered as a proper price differential in the different grades of coal, but I think that it is reasonable to assume that, if one coal is five percent higher in ash and fifteen percent lower in British thermal units than another coal with approximately the same percentage of volatile, fixed carbon and sulphur, it is twenty percent less efficient and, therefore,

worthy twenty percent less.

Wherever it is possible to procure what is commercially known as a high grade semi-bituminous coal and practicable to purchase under an analysis specification, I consider this method most desirable.

ANALYSIS OF GOOD BUNKER COAL

Coals of the following approximate analysis should be considered good coals for marine use:

Volatile not over 24 percent.

Fixed carbon not less than 66.5 percent.

Ash not over 8 percent.

Sulphur not over 1.5 percent.

British thermal units, dry coal, not less than 14,500.

In some localities coals can be procured that will produce a better analysis than the above, while in other localities the best coal obtainable will not equal the above analysis.

CONCLUSIONS

In summarizing the above, the following are the most important features that should be given the closest possible supervision in order to reduce the fuel cost to the absolute minimum:

1. Study the market conditions carefully and buy right.
2. Be absolutely assured that the quantity and quality of fuel that you purchase is actually delivered to your vessel.
3. Keep vessels' "burning equipment" in proper repair to efficiently burn the fuel.
4. Obtain from vessels' personnel the highest possible efficiency in handling and burning fuel aboard the vessels.

BULLETIN No. 126, entitled "An Investigation of the Fatigue of Metals, Series of 1922," is the second report to be issued on the investigation of this subject by the University of Illinois. Copies may be obtained without charge by addressing the Engineering Experiment Station, Urbana, Illinois.

Does it Pay to Have a Satisfied Crew?

CAPTAIN JOHN F. MILLIKEN, secretary of the Neptune Association, states in a feature article which will appear in the June issue of MARINE ENGINEERING AND SHIPPING AGE, that "sooner or later our shipping men will discover that the cheapest men are not always the most economical and that a satisfied crew pays real dividends."

One suggestion he offers to attract men to the service and to make the operating problems their own is to encourage them to purchase a few shares of stock. As stockholders in a company these men will take a personal interest in the success of the fleet.

Designing the Marine Power Plant for Efficiency

Analysis of Factors Affecting the Economy of Various Types of Main Drive, Auxiliary Equipment and Economizers, with Practical Examples

By Warren B. Flanders*

THAT greater efficiency in the operation of steamships under the American flag is not only needed, but will be obtained, is evidenced from the great increase in attention being paid to this subject. This is evidenced not only by the operating management, who take a keen interest in the subject from the dollars and cents point of view, but by the engineering personnel as a matter of professional interest.

Of recent years there has been great progress in the development of the steam turbine and its use for ship propelling machinery. This development has progressed along the lines of the direct-connected turbine (for use with the higher speed vessels only), the single reduction geared turbine, the double reduction geared turbine and the use of generators and motors between the turbine and propeller. (These three systems are applicable to moderate or low powers as well as high.) In this development there has been a marked advance in economy, and numerous reports have established the relative efficiencies of these types of equipment. The following table, therefore, might be taken as a fair statement of the relative performances in the way of steam consumption of the different types for the same class of vessel, where superheat is not employed.

TABLE 1

Type of Propulsion	Steam Consumption per Shaft Horse-power Hour—Main Engines	Relative Consumption Percent
Triple expansion	15.0	128
Direct connected turbines*	13.0	111
Single reduction geared turbine	12.7	109
Electric drive	12.2	104
Double reduction geared turbines	11.7	100

*Used for large powers only.

On the basis of the same conditions of steam pressure and quality of steam, this comparison indicates the progress that has been made in better economy in the engine room and, of course, reduction in steam consumption means a similar reduction in fuel consumption with a net saving to the operators of the percentage indicated.

SAVINGS POSSIBLE WITH SUPERHEATERS

Further savings have been effected by the use of superheaters, and undoubtedly great progress is being made in this direction, the high speed gear or electric drive turbines making possible the utilization of high superheats with safety. Thus, with 100 degrees superheat, the steam consumption of the engine room may be reduced 10 percent and, as the same, or even slightly higher boiler efficiency may be obtained with this amount of superheat, the fuel consumption will be decreased 5 to 6 percent. With higher superheats, further gains may be expected, and there is a tendency to use even as high as 200 to 250 degrees superheat in certain cases. This, however, means a total steam temperature of from 600 to 700 degrees F., and entails special attention in the way of design of piping, valves and

miscellaneous equipment, especially pumps and other auxiliaries.

It is usual to indicate savings due to superheat as based on the use of dry and saturated steam and as savings in steam consumption. The matter of real interest is the net savings to be expected in *fuel* over the use of steam as normally delivered by the boilers. Fig. 1 has been prepared therefore, showing this saving based on the use of steam with a quality of 98 percent. The saving in steam consumption has been corrected for the additional heat required to superheat the steam and a constant boiler efficiency is assumed.

Some authorities claim 50 degrees of superheat may be obtained by waste heat superheaters with no increase of fuel

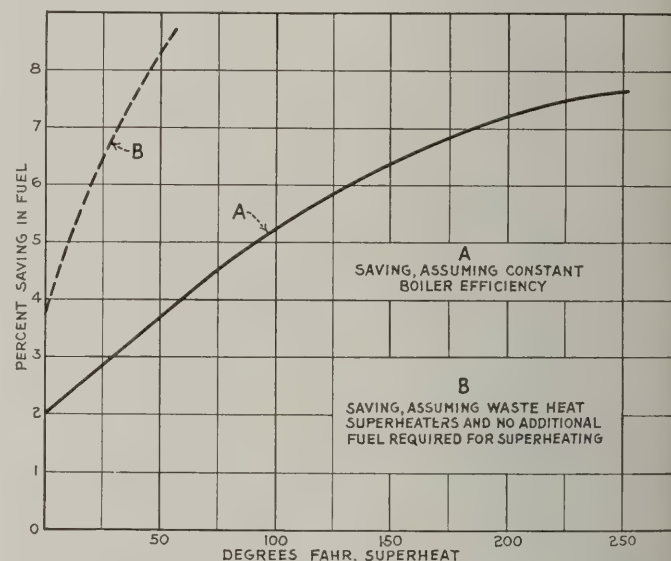


Fig. 1.—Saving in Fuel Consumption by Use of Superheat Based on Steam at 200 Pounds Gage Pressure, 98 Percent Quality, and Vacuum 28½ Inches in the Exhaust

consumption, in which case the curve would be as indicated by the dotted line.

HIGHER BOILER PRESSURES ECONOMICAL

Increased attention is being paid to the use of higher steam pressures combined with higher steam temperatures in the form of superheat, and it is not improbable that in a very few years a steam plant operating with 600 pounds pressure and 200 degrees superheat will be not uncommon. There are many problems, of course, to be worked out in connection with this progress, and these center largely around the selection of the auxiliary equipment on the ship and the methods of feedwater heating. The question of design of boilers, piping and main turbines may be said to be practically solved and it only awaits someone with sufficient initiative to go ahead with the carrying out of an actual installation.

By the use of 500 or 600 pounds steam pressure at a temperature of 600 to 700 degrees F., together with a suitable arrangement of auxiliaries, with particular attention paid to the heating of the feedwater, involving possibly the use

*Engineer, Marine Department, Westinghouse Electric & Manufacturing Company, South Philadelphia Works.

of economizers and air heaters, a fuel consumption for a 3,000 shaft horsepower vessel of 0.6 pound of oil per shaft horsepower is not an impossibility.

It is obviously necessary in order to attain such a performance that everything entering into the equipment be of the highest quality; that the ship be maintained in the best possible condition and the operating personnel be of the highest order of intelligence and ability, combined with a willingness to keep everlastingly at the details of operation. These are just the elements which may be expected in the American merchant marine, so there would seem to be no great obstacle in the way of this attainment.

FURTHER ECONOMIES IN THE BOILER ROOM POSSIBLE

There still seems to be a great deal of room for improvement in the economical operation of the average ship, and the greatest field in this direction is undoubtedly in the boiler room. C. J. Jefferson, in a paper recently read before the American Society of Mechanical Engineers, pointed out the possibility in this direction. Boiler plants, which average in service from 60 to 65 percent efficiency, as determined by actual investigation of many ships, are shown to be capable of operating with 80 percent efficiency or better, by merely paying proper attention to the firing conditions and in the maintenance of the boiler equipment in satisfactory condition. This item alone shows a possibility of saving 20 percent of the fuel used on the average vessel. Recent trials with a 1,500-horsepower equipment having oil-fired watertube boilers, made under actual sea conditions, show a similar saving possibility. An average consumption of oil a day of 20 tons for a large number of sister ships was reduced to 16 tons for a single ship when operated under a careful supervision, directed especially towards the economical burning of the oil.

WASTE ELIMINATION IN AUXILIARY UNITS

Next to the boiler room, the most fruitful field for improvement in economical performance is in connection with the feedwater heating system and the selection and operation of the auxiliaries. In an older type of engine drive, many of the principal auxiliaries were driven directly from the main engine, and this, combined with a moderate degree of feedwater heating, led to a degree of economy which offset some of the advantages to be obtained from the geared turbine installation. With the rapid development of this latter form of drive, the auxiliaries were largely separated from the main engines and little attention was paid, in many cases, to their economical operation. Comparatively wasteful direct connected turbines, or even reciprocating engines were used for driving circulating pumps, etc., with the result that the overall economy was in many cases disappointing.

The auxiliaries are necessary to the operation of the main machinery and the ship and may be classed as "Engine Room" and "Miscellaneous."

The engine room auxiliaries may be taken as:

- Boiler feed pumps.
- Boiler fuel oil pumps.
- Boiler blowers or fans.
- Condenser circulating pumps.
- Condenser air removal apparatus.
- Condenser condensate pumps.
- Turbine lubricating oil pumps.

The miscellaneous auxiliaries may be listed as:

- Ship lighting and power sets.
- Ballast pump.
- Fire and bilge pumps.
- Sanitary pumps.
- Refrigerating machinery, etc.

The total number of steam driven pumps and blowers of a large passenger vessel recently described, reaching the number of fifty, varying all the way from a 4½-inch by

2¾-inch by 4-inch horizontal hot water circulating pump, to the two 10,000 gallons per minute main circulating pumps.

THE HEAT BALANCE SHEET

A study of this equipment naturally brings up the subject of heat balance and plant economy.* Heat balance in engineering language at one time meant but one thing. It was a balance sheet, just like a financial balance sheet, in which the British thermal units in the fuel are balanced against the total British thermal units expended. Such a balance sheet is shown in Mr. Jefferson's paper above referred to, of which the following is an example:

Heat absorbed by boiler and superheater, percent....	84.6
Loss due to burning hydrogen in fuel, percent.....	6.0
Loss due to heat carried away due to dry gas, percent.	3.8
Loss due to carbon monoxide, percent.....	.2
Loss in unconsumed oil and unaccounted for, percent..	5.4
Heat in fuel as fired, percent.....	100.0

This shows the heat balance for the boiler room, and as far as this particular department is concerned, 84.6 percent of the heat in the fuel is delivered to the steam ready for use in the engine room.

Another heat balance of the same kind may then be made up for the engine room and this will show:

Heat turned into useful work on the propeller shaft, percent.....	15.4
Heat used in auxiliary power, percent.....	1.5
Radiation and leakage, percent.....	2.8
Heat rejected to sea water in condenser, percent....	64.7

Total heat received from boiler room, percent.....84.4

The above balance sheets are for an economical plant in which power would be produced for 0.91 pound of oil per shaft horsepower.

The term "heat balance" is now taken to also cover the preservation of a proper balance between the feedwater heating requirements and the amount of steam available from the auxiliary machinery for efficient feed heating.

When the large percentage of heat rejected to the sea water is considered, it is obvious that every attempt must be made to keep this amount low, and wherever possible, steam should be so used that any heat remaining therein after doing work, may go back to the boiler through the means of the feedwater, rather than be discharged to the condenser, where it is irrevocably lost. This form of heat balance deals directly with the choice of auxiliaries and their drives, such that the steam used by them, either directly or indirectly, will balance the feed and other heating requirements in so far as this can be done. The reliability of the auxiliaries is of primary importance and has a deciding influence on the choice.

ARRANGEMENT OF AUXILIARIES

There are many arrangements of auxiliaries and methods of drive, all with their different relative reliability and it is the economic phase of this matter that of late years has received very considerable attention on the part of stationary engineers, with the resultant considerable improvement in power plant economies.

The steam having passed through the main turbine and having been condensed, is usually delivered to the feed and filter tank, where it mixes with various drains and in some cases is given some heat from air ejectors or the exhaust from small pumps, etc. From there, it is usual to pass the feed through some form of feedwater heater, into the boiler. A feedwater heater may receive steam direct from the boiler and thus heat the feedwater to the temperature of the boiler steam, or the feed may be pumped into the boiler by

*Much of the material which follows was suggested to the author by Mr. Francis Hodgkinson, chief engineer, South Philadelphia Works, Westinghouse Electric & Manufacturing Company.

means of an ejector, the steam used in which heats the water directly with no loss of heat units. With the feed and the boiler alone considered, this operation is carried out at 100 percent efficiency, except for radiation. Such installations of heating by boiler steam have been actually made for the purpose of avoiding varying temperatures and consequent strains in the boiler. A case of this kind is reported in the harbor tug *Dresden* in Boston.

ENGINE EXHAUST USED FOR HEATING FEEDWATER

Considering the power plant as a whole, however, steam to be used for heating feed should be allowed to do as much useful work as possible, by expanding in an engine (turbine or reciprocating), when, with ordinary efficiencies, power may be produced for some purpose with but a use of 6 to 7 percent of the water heating capacity of the steam. Thus, considering boiler steam as a medium for heating, useful work may first be done and the exhaust used for the heating process, with a very slight loss in the heating capacity. Thus, it is possible, with steam at a pressure of 200 pounds at 98 percent quality, exhausting at 8 pounds back pressure, to produce a horsepower in the auxiliary turbine with 34.5 pounds of steam and assuming that the exhaust steam will give up all its heat at the exhaust pressure, we have the following balance:

Total heat in steam at 200 pounds... 1181.9 British thermal units
Total heat in liquid at 8 pounds.... 204.1 British thermal units
Heat available for work or heating.. 977.8 British thermal units
Heat used in doing work $2,545 \div 34.4 = 74.0$ British thermal units
($2,545 =$ British thermal units per horsepower)
Heat available for heating..... 903.8 British thermal units
Efficiency of work process $903.8 \div 977.8 = 0.925$

ECONOMICAL LAND INSTALLATIONS

The majority of economical land power plants are used for generating electricity and the main operating machinery runs at practically constant speed, and the electrical energy is generated at constant voltage. It has, therefore, been the rule in such plants to drive some of the auxiliaries directly by steam and some by electric motors. This permitted numerous arrangements for feedwater heating by means of steam which had done some work. Among these methods may be cited the following:

- A. Steam drive is used for such auxiliaries so that the exhaust steam condensed in a feedwater heater will give the feedwater temperature corresponding to the exhaust temperature of the auxiliaries, at the average operating condition of the main power unit, the balance of the auxiliaries being motor drive.
- B. The same general arrangement as "A" is followed, except that the auxiliary units are selected so as to give the maximum feedwater temperature at the full load of the main unit, and automatic means are provided for admitting the excess auxiliary exhaust steam into a suitable stage of the main power unit when this unit is operating at the lighter loads, when there will obviously be more auxiliary exhaust than can be used for heating the feed.
- C. The same arrangement as "A" is employed but with the addition of an automatic valve, which at light load on the main unit, permits the excess auxiliary exhaust steam to be admitted to the main unit, as in the case "B," and of a second valve, which at times of heavier than average loads, admits steam from a higher pressure stage in the main unit to make up the deficiency in exhaust from the auxiliary unit.
- D. All auxiliaries are driven direct from the main unit, usually through the use of electric motors taking power from the main turbine driven generator. The feed heating is accomplished by bleeding the turbine of the steam which can be condensed in the feedwater heater.
- E. A power unit is installed in addition to the main unit, this power or auxiliary unit operating a generator independently of the main turbines, and all of the auxiliaries are operated by means of motors from this auxiliary generating unit. The exhaust of this auxiliary unit is condensed in the feedwater heater giving the desired temperature.

- F. The same arrangement as in "D" is used, except that certain of the auxiliaries, in addition to the motor, have a steam turbine drive, the motor receiving energy from the main generating unit or from the steam turbine, which later may be controlled from time to time so as to give just the amount of exhaust steam necessary to maintain the feedwater temperature.

In the above feed heating systems, except possibly "D," the temperature to which the feedwater may be raised is that of the temperature of the auxiliary exhaust steam. It would certainly be economical and beneficial, from the mechanical standpoint of a boiler, if the feedwater were heated somewhere near the temperature of evaporation. To do this, the water could be heated by steam direct from the boiler, but this would give a mechanical advantage only. The system "D," outlined above, could be arranged to bleed the steam from the main turbine at several points, each at a different pressure and each using its separate feedwater heater. This would certainly be economical, but would quickly become impracticable, because of the cumbersomeness of the heaters if many stages were employed.*

USE OF ECONOMIZERS

Another method of accomplishing this additional feed heating is by means of economizers, where the waste gases from the boilers pass through heating elements to which water is admitted at the temperature of the feed heater and brought up to as near boiler temperature as practical. Economizers have been used in marine practice. (Admiral Dyson shows an arrangement in his book on page 82 in the case of Belleville boilers.)

So far as land practice is concerned, economizers are accepted as a standard equipment, and they certainly are a vital factor in obtaining high plant efficiency. Where higher steam pressures are to be employed, it would seem that the economizers become practically necessary, if the full benefits of the high pressure are to be realized. At ordinary pressures, whether or not the cost of the installation is warranted, depends upon the cost of fuel and the maintenance charges of the economizers. It is probable that their installation can be shown to be warranted in almost any case from an economic standpoint.

Reference has been made to the condensing of the exhaust steam in the feedwater heater and it should be borne in mind that the condenser and the feedwater heater are exactly similar pieces of apparatus performing the same function, i. e., the use of water to condense steam. In one, the condensing of the steam is the primary object, and the heat is lost. In the other, the conservation of the heat is the primary object, and the condensing of the steam becomes secondary.

TYPES OF FEEDWATER HEATERS

As in condenser practice, there are surface and jet condensers, so with the use of feedwater heaters, there are surface and jet types. The jet types are usually referred to as open feedwater heaters, this name coming from an ancient land practice where the heater was actually opened to atmosphere. In marine work in this country the practice has been to use only the closed or surface type of feed heater, and this is probably one of the contributing causes of the severe corrosion often found in boilers and turbines aboard ship. With this form of heater it is usual for the water to enter at a pressure in excess of that of the boiler and, therefore, even though it may be heated to a temperature of 235 degrees F., it is very far from the actual boiling point. With a feedwater pressure of 300 pounds and a temperature of 235 degrees F., the water is 187 degrees below the temperature of evaporation. The result of this is that the air which is almost certain to be included in the feed-

*A discussion of this is given in Dinger's "Naval Machinery," pages 160 to 163.

water, does **not** separate or boil off from the water. Were the water in this same heater kept at the pressure corresponding to the temperature, a very large percentage of the air would be driven out and, if the jet form of heater were used, where the water and steam actually mixed, a very large percentage of the air would be expelled without difficulty. By proper venting of the heater, this air can be permanently removed from the feed.

This jet form of heater might well be incorporated with the feed and filter tank, or if it were still desired to have them separate, the feed and filter tank could be raised and the water allowed to flow to the jet heater and the feed pumps would draw their water from it and deliver it to the boilers. It is obvious that the heater must be located at some elevation above the feed pump so that the water actually in the pump will be below the temperature of evaporation, although the water in the heater may be actually boiling.

With this type of heater vented through a small tubular heater, so that any steam escaping with the air is condensed by the feed passing through the tubular heater, it is possible to obtain a feed temperature corresponding to the temperature of evaporation of the pressure in the heater and this is done without wasting any heat or permitting any steam to escape to atmosphere.

OXYGEN IN THE FEEDWATER

It is very easy for oxygen to enter the feed system and it is very important that as much of it as possible be removed. A common cause of air in the feed is leaks in the glands or stuffing boxes of the feed pumps. Another common cause is for the feedwater to fall through the open air

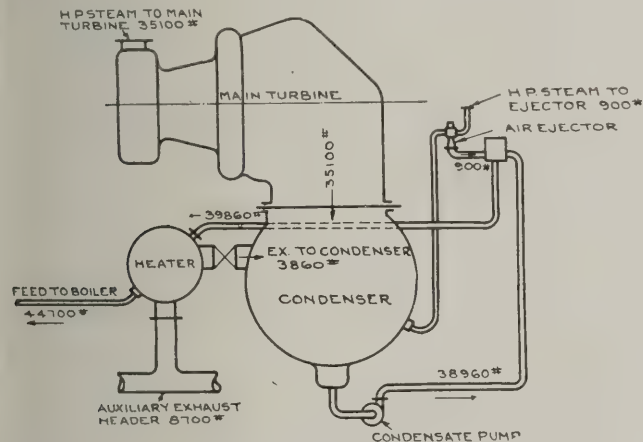


Fig. 2

into the feed and filter tank; this may be very serious. Slight air leaks in the vacuum system are responsible for considerable oxygen in the feed. It is, therefore, desirable to keep the system as tight as possible and to take every precaution to prevent air getting into the feed, and, in addition, to do whatever can be done to drive the air out of the feed after its unpreventable inclusion.

Taking up again the types of auxiliaries and their relation to the feed heating system in merchant marine work, none of the arrangements "A" to "F," inclusive, listed above, is ordinarily employed. This is because the load condition is essentially a constant one. Practically all of the auxiliaries are steam driven, each with its independent steam cylinder, engine or turbine, and it is almost certain that the steam which will be exhausted from these various units, which are necessary to the operation of the ship, will be in excess of that required for feedwater heating.

PRACTICAL HEAT BALANCE EXAMPLES

Bearing in mind that the passing of heat to the condenser **must** be avoided, any improvement in the efficiency

of the steam consumption of the auxiliary units is desirable. This is perhaps best illustrated by examples of heat balance under conditions approximating those actually obtained in practice. These examples are based on a cargo-carrying ship equipped with geared turbine driven propelling machinery and operating the greater part of the time at the normal load of 3,000 shaft horsepower. The steam pressure is assumed to be 200 pounds gage at a quality of 98 percent and the vacuum in the exhaust is assumed to be 28½ inches mercury referred to a 30-inch barometer.

Table 2 gives the assumed power and steam consumption of the various auxiliaries as they would be operated under the average steaming condition.

TABLE 2

Auxiliary	Type	Horse-power	Pounds Steam per Hour
Boiler feed pump	Reciprocating	15	1,500
Boiler fuel oil pump	Reciprocating	2	200
Boiler blowers	Centrifugal, engine driven	12	500
Condenser circulating pump....	Centrifugal, geared turbine drive	60	2,300
Condenser air removal apparatus	Ejectors		900
Condenser condensate pump ...	Centrifugal, turbine drive	4	400
Turbine lubricating oil pump ...	Reciprocating	2	200
Lighting set—15 kilowatts	Turbine Drive	23	1,100
Miscellaneous auxiliaries	Reciprocating and turbine drive	30	2,500
Total		152	9,600

Example 1—Steam Driven Auxiliaries—No Feed Heating

Steam pressure—200 pounds gage.
Steam—98 percent quality.
Vacuum in exhaust—28½ inches.
Shaft horsepower—3,000.
Steam consumption—main turbines—11.7 pounds per shaft horsepower.
Total steam per hour..... 35,100 pounds
Principal auxiliaries (= 118 horsepower) steam per hour.... 6,200 pounds
Miscellaneous auxiliaries—steam per hour..... 2,500 pounds
(including air removal from condenser)
Total steam generated per hour..... 44,700 pounds
Total heat in steam above 32 degrees F..... 1,181.9 British thermal units
Temperature of condensate—90 degrees F.
Heat of liquid in condensate..... 58.1 British thermal units
Heat added per pound of feed to make steam... 1,123.8 British thermal units
British thermal units consumption $\frac{1,123.8 \times 44,700}{3,000} = 16,750$ per shaft h'power
Assuming fuel oil of 18,500 British thermal units per pound, and a boiler room efficiency of 78 percent, the fuel consumption would be—
 $16,750 \div (18,500 \times 0.78) = 1.16$ pounds per shaft horsepower

Example 1-a

Conditions the same as in Example 1 except all auxiliaries are reciprocating with the exception of the blowers. Then the auxiliary steam consumption would be increased to about.....15,000 pounds per hour
The fuel consumption would be.....1.31 pounds per shaft horsepower hour

Example 2—Steam Driven Auxiliaries—Fig. 2

Feed heated to 235 degrees F., excess exhaust to condenser.
Steam pressure—200 pounds gage—98 percent quality.
Vacuum—28½ inches.
Shaft horsepower—3,000.
Steam consumption—main turbines—11.7 pounds per shaft horsepower hour.
Total steam, pounds per hour..... 35,100
Principal auxiliaries (118 horsepower)..... 6,200
Principal auxiliaries steam per hour, pounds..... 6,200
Miscellaneous auxiliaries steam per hour, pounds..... 2,500
Air ejectors steam per hour, pounds..... 900
Total steam per hour, pounds..... 44,700
Total heat in air ejectors—steam above 32 degrees F., 1,100 British thermal units
(Note—The ejectors have done work in removing air from the condenser.)
Temperature of condensate 90 degrees F.
Heat of liquid..... 58.0 British thermal units
Heat in each pound of ejector steam available for heating 1,041.9 British thermal units
Total British thermal units in ejector steam $1,041.9 \times 900 = 938,000$ British thermal units per hour.
Rise in feed temperature $= \left(\frac{938,000}{35,100 \times 900} \right) = 26$ degrees F. (See note.)
Temperature of feed and filter tank—116 degrees F.

British thermal units needed per pound of feed to heat to 235 degrees F. =
 $235 - 116 = 119$.

$$\text{Total exhaust steam needed} = \frac{36,000 \times 119}{1,000} = 4,280 \text{ pounds}$$

Note—It is assumed that each pound of exhaust steam condensed at 235 degrees F. will give up 1,000 British thermal units.

This will leave $8,700 - 4,280 = 4,420$ pounds of exhaust steam not usable in the heater, and part will go to the condenser and part will be used to heat the first part in the feed heater. The error made in assuming 1,000 British thermal units given up in condensing in either heater or condenser will be very small; therefore, if X = amount of steam to condenser, $4,420 - X$ equals the amount used to heat it from 90 degrees to 235 degrees F. This requires 145 British thermal units per pound, or

$$X \times 145 = (4,420 - X) \times 1,000 \text{ or } 1,145 X = 4,420,000$$

or $X = 3,860$ pounds to the condenser and 560 pounds used in the heater.

Whether the steam condensed in the heater goes to the feed and filter tank, raising the temperature there, or whether it mixes directly with the feed, will make so little difference in this heat balance that it is assumed to mix with the feed.

Total heat in steam above 32 degrees F. 1,181.9 British thermal units
 Heat in liquid of feed at 235 degrees F. 203.6 British thermal units

Heat added to feed per pound to make steam. . . 978.3 British thermal units

British thermal units consumption =

$$\frac{978.3 \times 44,700}{3,000} = 14,580 \text{ pounds per shaft horsepower}$$

Fuel consumption = $14,580 \div (18,500 \times 0.78) = 1.01$ pounds per shaft horsepower hour.

(Note—There being an excess of exhaust steam for feed heating, the final result would be the same if the heating from the ejector steam were calculated as if occurring in the feed heater.)

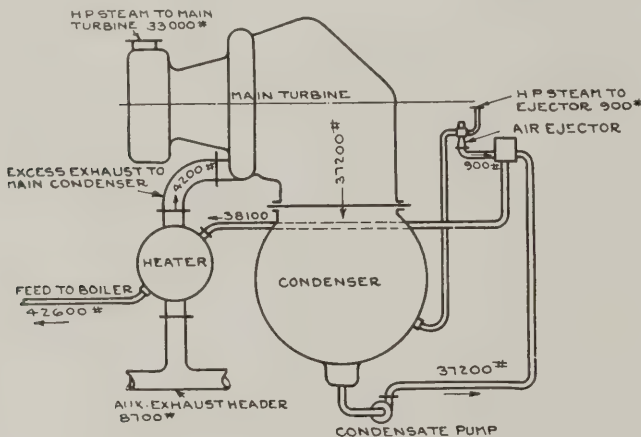


Fig. 3

Example 3—Steam Driven Auxiliaries—Fig. 3

Feed heated to 235 degrees F.—excess exhaust to main turbine.
 Steam pressure—200 pounds gage—98 percent quality.
 Vacuum—28½ inches.

Shaft horsepower—3,000.

Total auxiliary exhaust—pounds per hour—9,600 pounds.

Excess auxiliary exhaust admitted at point of main turbine where pressure is 18 pounds absolute. Then for adiabatic expansion—

British thermal units at 215 pounds absolute 98 percent quality. 1,181.9

British thermal units at 28½ inches vacuum. 834.8

347.1

British thermal units at 18 pounds absolute. 1,003.7

British thermal units at 28½ inches vacuum. 834.8

168.9

Therefore, steam entering the main turbines at 18 pounds absolute will do

approximately $\frac{168.9}{347.1} = 49$ percent of the work of high pressure steam.

The error in assuming that one pound of exhaust steam will do work in the low pressure end, which will save one-half pound of high pressure steam, is very small.

Let X = the pounds of auxiliary exhaust steam per hour which passes into the main turbine:

Then $9,600 - X$ is the amount used in heating feed and $\frac{X}{2}$ is the amount

of high pressure steam saved. Total steam to condenser equals high pressure steam or $3,000 \times 11.7 - \frac{X}{2} = 35,100 - \frac{X}{2}$, plus the exhaust steam ad-

mitted to the turbine or X pounds or the total condensate is

$$\left(35,100 - \frac{X}{2}\right) + X = 35,100 + \frac{X}{2}$$

The British thermal units per pound of feed needed to heat from a condensate temperature of 90 degrees to 235 degrees F. = 145 or the exhaust steam needed for heating equals

$$(9,600 - X) = \left(35,100 + \frac{X}{2}\right) \times 145 \div 1,000$$

(1,000 British thermal units is the heat given up in condensing each pound of exhaust.)

Therefore, $X = 4,200$ and $9,600 - X = 5,400$.

The total main turbine high pressure steam = $35,100 - \frac{4,200}{2} = 33,000$

The total auxiliary steam per hour = ... 9,600

Therefore, the total feed in pounds per hour = ... 42,600

From Example 2, the heat required per pound of feed to generate steam = 978.3 British thermal units;

and the British thermal units consumption = $\frac{978.3 \times 42,600}{3,000} = 13,900$

pounds per shaft horsepower.
 Fuel consumption equals $13,900 \div (18,500 \times 0.78) = 0.96$ pound per shaft horsepower hour.

Example 3-a

Conditions the same as in Example 3 except that as in Example 1-a all auxiliaries, with the exception of the blowers, are reciprocating.
 Total auxiliary exhaust—pounds per hour = 15,000.

$$\text{Then } (15,000 - X) = \left(35,100 + \frac{X}{2}\right) \times 145 \div 1,000$$

or $X = 9,250$ pounds and $15,000 - X = 5,750$ pounds.

Total main turbine high pressure steam = $35,100 - \frac{9,250}{2} = 30,475$

Total auxiliary steam = ... 15,000

45,475

Therefore, fuel consumption equals 1.03 pounds per shaft horsepower hour.

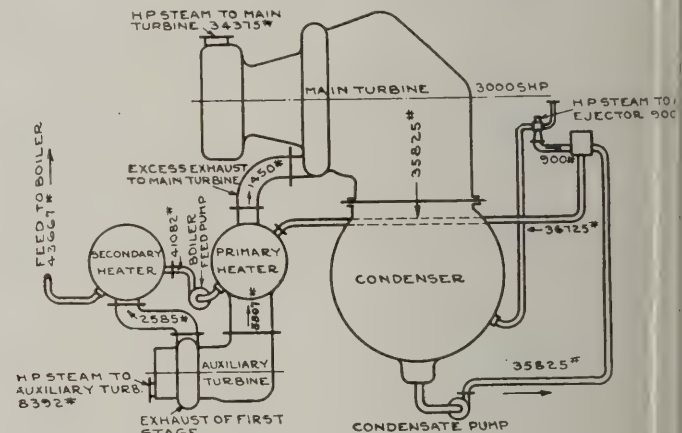


Fig. 4

Example 4—Circulating Pump and Boiler Feed Pump Driven from Main Turbine—Other Auxiliaries Separately Steam Driven

Total shaft horsepower to propeller = 3,000.

Additional shaft horsepower to drive circulating and boiler feed pumps = 80.

(Note—Allow 5 shaft horsepower additional for drive of boiler feed pump.)

Total auxiliary exhaust = 5,800 pounds.

Then, as in Example 3:

$$\text{High pressure steam to main turbine} = 3,080 \times 11.7 - \frac{X}{2}$$

equals $36,050$ pounds — $\frac{X}{2}$ and total exhaust

equals $36,050$ pounds + $\frac{X}{2}$ pounds per hour.

$$\text{or } (5,800 - X) = \left(36,050 + \frac{X}{2}\right) \times 145 \div 1,000$$

or $X = 535$ pounds and $5,800 - X = 5,465$ pounds.

The total main turbine high pressure steam = $36,050 - \frac{535}{2} = 35,782$

The total auxiliary high pressure steam = ... 5,800

Therefore, the total feed in pounds per hour = ... 41,582

The British thermal units consumption = $\frac{978.3 \times 41,582}{3,000} = 13,560$ per

shaft horsepower,
 and fuel consumption = $13,500 \div (18,500 \times 0.78) = 0.94$ pound per shaft horsepower hour.

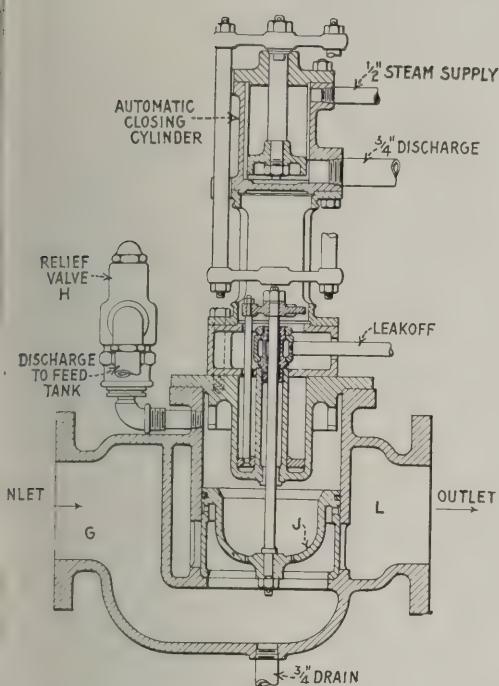


Fig. 5

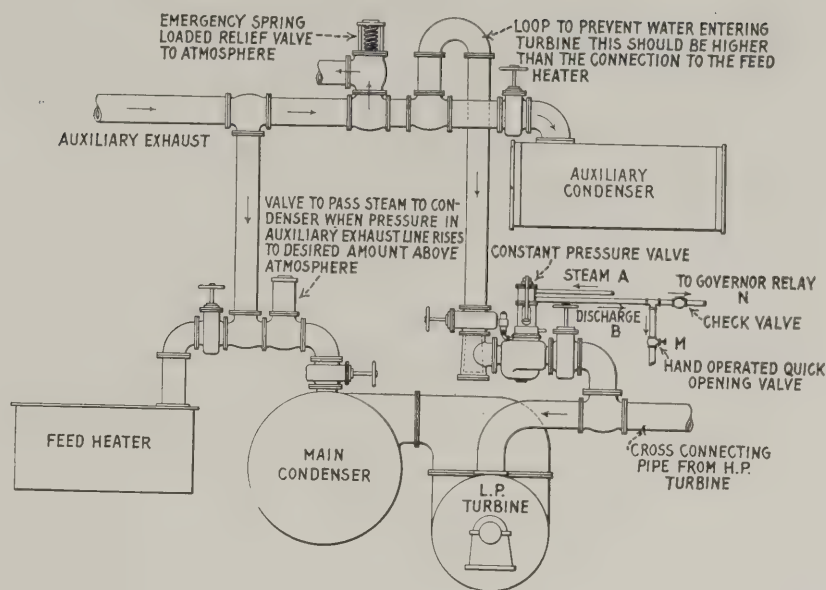


Fig. 6

CONDITIONS ASSUMED IN EXAMPLES

It will be seen that in all of the above examples the conditions outlined in arrangement "A" are only approximated, as it is impracticable to have any electrically driven auxiliaries receiving their power from the main power unit. Example 4 approaches most nearly to the conditions of arrangement "B" and in the arrangements suggested for Example 3 and 4, the automatic valve for admission of the auxiliary exhaust steam to the main unit is quite desirable as there will always be some steam going through this connection. Such a valve is shown in Fig. 5 and its arrangement in the ship, in Fig. 6.

The excess steam from the auxiliary exhaust line would enter at G, Fig. 5, passing out to the turbine at L. A small amount of steam leaks past piston J and its pressure is regulated by the relief valve H, which can be set to any desired pressure. Steam entering at G will tend to build up a pressure under piston J and will cause it to lift until the pressure in G balances the pressure maintained by the relief valve when the piston J will remain stationary, allowing the steam to flow through the ports indicated to L irrespective of the pressure in L as long as it is below the pressure at the inlet G.

The mechanism shown on the top of the valve is connected to the maneuvering valve and to an overspeed governor so that in case it is necessary to shut off steam to the main unit, this automatic "constant pressure valve" will be shut at the same time the main steam inlet is shut, allowing the excess steam to go direct to the main or auxiliary condenser through a suitable relief valve which is set at a higher pressure than is desired in the exhaust line normally.

Examples 1 to 3 show how the fuel consumption of the ship has been reduced 17½ percent by the method of feed heating, using the same equipment of main and auxiliary units. Example 4 shows how a further reduction of 3 percent in total fuel can be effected by driving certain of the auxiliary units directly from the main power unit.

It might, of course, be desirable to extend the arrangement suggested in Example 5 so as to approximate the conditions of arrangement "D," in which all the auxiliaries could be driven from the main unit, the feed heating being

accomplished by bleeding steam from the main turbine and with such an arrangement, if it were possible, a fuel consumption of 0.845 pound per shaft horsepower hour could be obtained. Such an arrangement would be too complicated and, of course, in the case of many auxiliaries, it would be entirely impracticable to drive them directly as such an arrangement necessitates that most of the auxiliaries be capable of being operated when the main unit is shut down and this would run into excessive duplication.

It is possible, however, to employ arrangement "E" and with the modern development of electrical apparatus, there seems to be no reason why such a drive for all of the auxiliaries, the driving motor receiving its power from a central generating unit, cannot be successfully employed. Example 5 indicates the economy of such an arrangement.

Example 5—All Auxiliaries Motor Driven Except Air Ejector

Motors supplied with power from a two-stage turbine driven generator. Steam bled from the exhaust of the first stage into a secondary feed heater and the turbine exhausting into a primary feed heater with the excess going to the main turbine. See Fig. 4.

Total auxiliary power (see Table 1), 152 horsepower. Assuming 80 percent average motor efficiency, the load on the generator will be 142 kilowatts.

(200 kilowatt generating sets would be used to allow a margin of power.)

First stage of turbine, inlet pressure, pounds per square inch absolute... 155

First stage of turbine, exhaust, pounds per square inch absolute... 65

Total British thermal units available for work... 67.5

Exhaust pressure of turbine... 25 pounds absolute

Total British thermal units available for work from 155 absolute to 25 pounds absolute... 135

Therefore, first stage does about 50 percent of the total work or each pound of steam bled from first stage requires one-half pound to be added to maintain the required power.

Steam consumption complete unit in pounds per kilowatt hour... 50

Total steam, if no steam bled = 50 × 142 = 7,100 pounds per hour

Steam per hour from ejector = 900

Total (no bleeding) ... 8,000 pounds per hour

Temperature of steam at 65 pounds absolute = 298 degrees F.

Let X = exhaust steam to main turbine.

Y = steam bled from first stage of auxiliary turbine.

$\frac{Y}{2}$ = amount of high pressure steam added to make up for bleeding.

then $\left(35,100 + \frac{X}{2} \right)$ = pounds steam per hour (see Example 3) to condenser.

$\left(8,000 - \frac{Y}{2} \right)$ = pounds steam per hour exhausted from auxiliary turbine and ejector.

Assume primary heater heats the feed from 90 degrees to 235 degrees F., and the secondary heater from 235 degrees F. to 298 degrees F.

Then the heat added in primary heater

$$= \left(35,100 + \frac{X}{2} \right) \times 145 = (5,090,000 + 72.5 X) \text{ British thermal units per hour.}$$

$$\text{The steam used for this} = \left(8,000 - \frac{Y}{2} \right) - X$$

$$\text{or } \left(8,000 - \frac{Y}{2} \right) \times 1,000 - 1,000 X = 5,090,000 + 72.5 X$$

or X = amount of exhaust steam to main turbine = $2,710 - 0.466 Y$ pounds per hour.

$$\text{The total feed to secondary heater} = \left(35,100 - \frac{X}{2} \right) + 8,000 - \frac{Y}{2} = 43,100 - \frac{(X + Y)}{2}$$

$$\text{The heat added in secondary heater} = \left[43,100 - \frac{(X + Y)}{2} \right] \times (298 - 235) = 2,715,000 - (X + Y) = 31.5$$

$$\text{or } 1,000 Y = 2,715,000 - 31.5 (X + Y), \text{ but } X = 2,710 - 0.466 Y$$

$$1,000 Y = 2,715,000 - 31.5 (2,710 + .534 Y) = 2,629,600 - 16.8 Y$$

$$Y = 2,585 \text{ pounds}$$

$$X = 1,450 \text{ pounds}$$

$$\text{Total steam to main unit} = 35,100 - \frac{X}{2} = 34,375 \text{ pounds per hour}$$

Total steam to auxiliary turbine

$$\text{and ejector} = 8,000 + \frac{Y}{2} = 9,293 \text{ pounds per hour}$$

$$\text{Total feed at temperature of 298 degrees F.} = 43,668 \text{ pounds per hour}$$

British thermal units above 32 degrees per pound of steam..... 1,181.9

British thermal units above 32 degrees per pound water at 298 degrees F. 267.8

British thermal units added to feed per pound of steam..... 914.1

$$\text{The British thermal unit consumption} = \frac{914.1 \times 43,668}{3,000} = 13,300$$

$$\text{Fuel consumption equals } 13,300 \div (18,500 \times 0.78) = 0.92 \text{ pound per shaft horsepower hour.}$$

Note—Peabody's Steam Tables were used for these calculations.

By the use of a single pass condenser and a propeller type circulating pump, the power needed for this unit could be reduced 40 percent, or from 60 to 36 horsepower, and by careful proportioning of other auxiliaries it might be possible to reduce the auxiliary power from 152 horsepower to 115.

Example 5-a

Total auxiliary power..... 115 horsepower
Generator load 108 kilowatts
(150 kilowatt generating sets could be used.)

Auxiliary turbine designed as in Example 5 as to stage pressures, etc.

Total steam, if no steam bled = $51 \times 108 = 5,500$ pounds per hour

Ejector 900 pounds per hour

Total 6,400 pounds per hour

then as in Example 5—

$$\left(6,400 - \frac{Y}{2} \right) \times 1,000 - 1,000 X = 5,090,000 + 72.5 X;$$

$$X = 1,220 - 0.466 Y$$

$$\text{Feed to secondary heater} = 35,100 - \frac{X}{2} + 6,400 - \frac{Y}{2} = 41,500 - \frac{X + Y}{2}$$

The heat added in secondary heater

$$= \left(41,500 - \frac{X + Y}{2} \right) \times (298 - 235) = 2,610,000 - 31.5 (X + Y)$$

$$\text{or } 1,000 Y = 2,610,000 - 31.5 (1,220 + 0.534 Y) = 2,571,600 - 16.81 Y$$

$$Y = 2,530 \quad X = 40 \text{ pounds (or practically nothing)}$$

In other words, the auxiliary exhaust is just sufficient to heat the feed by use of two stage heating.

Total steam to main unit = 35,080 pounds per hour

Total steam to auxiliary turbine

$$\text{ejector} = 6,400 + \frac{Y}{2} = 7,665 \text{ pounds per hour}$$

Therefore, total feed at temperature of 298 degrees F. 42,745 pounds per hour

British thermal units added per pound of feed — 914.1

British thermal units consumption = 13,000 per shaft horsepower hour

and fuel rate = 0.9 pound per shaft horsepower hour.

It is interesting to note the result if only the primary heater were employed, using the same turbine and auxiliaries as in Example 5.

Total auxiliary exhaust..... 8,000 pounds per hour

$$\text{then } 8,000 - X = \left(35,100 + \frac{X}{2} \right) \times 145 \div 1,000$$

$$X = 1,875 \text{ and } 8,000 - X = 6,125$$

Total high pressure steam to main turbine = 34,163 pounds per hour

Total auxiliary steam..... 8,000 pounds per hour

Total feed 42,163 pounds per hour

British thermal units rate = 13,750.

Fuel consumption = 0.955 pound per shaft horsepower hour or 5 percent higher for the same equipment, but not employing two stage heating.

ELECTRIC DRIVE AUXILIARIES

While the use of steam driven auxiliaries has been considered necessary in the past, this idea has been undergoing modification in land power plants. The steam driven unit used to be considered as the most reliable and, while the various units were usually small and uneconomical, it was generally considered that this was unimportant and that since the exhaust steam was either condensed in a feed-water heater or did work in the main turbine, that the actual economy of the unit made no difference. As has been pointed out, however, there may be a big difference in the overall results, as with a more economical drive, less steam would be required to produce the auxiliary power with the saving in total fuel as pointed out above. At the present time, however, electric motors and their circuits are probably even more reliable than the small steam driven units and can be counted on to maintain their functions with less danger of stoppage or interruption. This is certainly true in land practice and will undoubtedly become equally true in marine practice as waterproof motors, wiring and controls are more fully developed.

For the vital auxiliaries the arrangement "F" with both motor and steam turbine drive, should be employed, or duplicate steam driven units should be installed. In the case of the circulating pump, the dual drive of motor and turbine would be suitable. For the feed pump and fuel oil pump, a stand-by steam driven unit would probably be chosen. Duplicate condensate pumps, each with motor drive, would be satisfactory for the main condenser, and these units could be shut down for a reasonable length of time without jeopardizing operation. The same is true of lubrication oil pumps and most of the auxiliaries.

Care must, of course, be taken to insure against interruption of electric circuits and the control of the vital engine room auxiliaries should be grouped together as separate as possible from the circuits for the general ship service. Circuit breakers or other protective devices on the general power and lighting circuits should be more sensitive than those for the vital auxiliaries and it is not improbable that automatic interrupting devices would be eliminated from these latter circuits. Where the total power is sufficient, it is desirable to keep the generating units for the vital auxiliaries separate from those for the general ship's circuits. Where the power is too small, the bus for the one could be connected to the generator without automatic circuit breakers, while the bus for the other general circuit could be protected by such breakers.

While the question may be raised that the improvement of efficiency shown by the various arrangements discussed may be offset by other conditions, it must be remembered that the relative gains indicated will be realized, although it may be difficult to actually measure them in a comparison of any actual installations. Thus, the installation which should show a fuel consumption of 0.92 pound per shaft horsepower hour may be handicapped by poor boiler room efficiency and actually have a poorer consumption than should be given by Example 3, which might in practice have a higher boiler room efficiency. If, in Example 3, the boiler room efficiency were 80 percent, the fuel consumption would be 0.94 pound per shaft horsepower hour, while, if in Example 5, the boiler room efficiency were 80 percent instead of 78 percent, the fuel consumption would be 1.11 pounds per shaft horsepower hour. On the other hand, the rate of 0.94 would have been reduced to 0.90 if the change in auxiliary drive and feed heating outlined. A common reason for not maintaining the highest possible attainable efficiency of a given plant is that it is difficult

actually measure the benefits or the gains derived from improvements because of other changes taking place which tend to offset the gains and it is, therefore, sometimes advisable to listen to the "theorists" rather than to the so-called "practical man" who can only believe what he can measure with a rule or scale.

IMPORTANCE OF AUXILIARY ECONOMY

The importance of auxiliaries in obtaining economical operation cannot be too strongly emphasized. They should be so maintained as to give their best possible performance at all times. Mere ability to operate without stopping is not enough. A recent test of a small engine driven lighting set supposed to operate on less than 100 pounds of steam per kilowatt hour, showed an actual consumption of over 300 pounds per kilowatt hour. The engine ran fairly well, but leaky pistons, changes in valve settings, etc.,

has been referred to above, the use of an economizer to further heat the feed from 300 degrees to 350 degrees and the use of air heaters placed in the gases after they have been passed through the economizers would result in very low stack temperatures with a definite gain in overall economy. It must be realized that the art of building economizers is progressing and many of the problems in the past which have been found difficult are now solved and such pieces of apparatus can no longer be considered impracticable, even though their cost may be formidable.

With the use of such equipment, the assumed boiler efficiency of 78 percent might be readily increased to 87 percent and our fuel consumption in Example 5 would be reduced from 0.92 to 0.823 pound per shaft horsepower hour.

The use of high steam pressure and superheats has been referred to and it is of interest to study along the same line of the preceding examples what fuel consumptions could be expected in such an installation. For this study, a boiler pressure of 600 pounds gage, superheating the steam 200 degrees F. has been assumed. Superheaters, economizers and air heaters would all be employed and the auxiliaries would all be motor driven as in Example 5. The main turbine would be divided into three portions, consisting of a high pressure turbine, intermediate pressure turbine and low pressure turbine. The high pressure turbine would take steam at 500 pounds absolute (allowing a 115-pound drop between boiler and turbine) and would exhaust to a pressure of 160 pounds absolute. The intermediate pressure turbine would take steam at this pressure and exhaust at 13 pounds absolute, and the low pressure turbine would exhaust to a 28½-inch vacuum as previously assumed. (Other pressure distributions may be found to be even more economical, depending on the actual installation.)

caused the enormous increase in steam consumption. Similarly, other pumps and engines can soon deteriorate so that the total auxiliary consumption is excessive and the condition assumed in Example 2-a is a real one.

Occasional tests of the steam consumption of the various auxiliaries while in port is not only practicable, but well worth while.

MAINTAINING A HIGH VACUUM

There are, of course, many other departments in which improvements in efficiency can be realized by care and knowledge of the fundamental characteristics of the apparatus. This is particularly true in relation to the condenser and the vacuum maintained under varying conditions of sea water temperature, etc. A tight vacuum system and clean tubes, both inside and out, are well repaid in maintenance of high efficiency. The accumulation of oil and grease on the surface of the condenser tubes may readily give a loss in vacuum of 1 inch and this will affect the overall efficiency from 4 to 6 percent. One inch of vacuum may readily be lost by air leaks and an equal amount by logging up of the circulating cooling water system, particularly the condenser tubes.

WASTE GAS AIR HEATERS

Economizers have been suggested, too, and what is perhaps more common in ships, the use of air heaters, in which the waste gases preheat the air to the burners. Where higher boiler pressures are to be employed, it is possible that both economizers and air heaters may prove advantageous. With the high temperature feedwater heating that

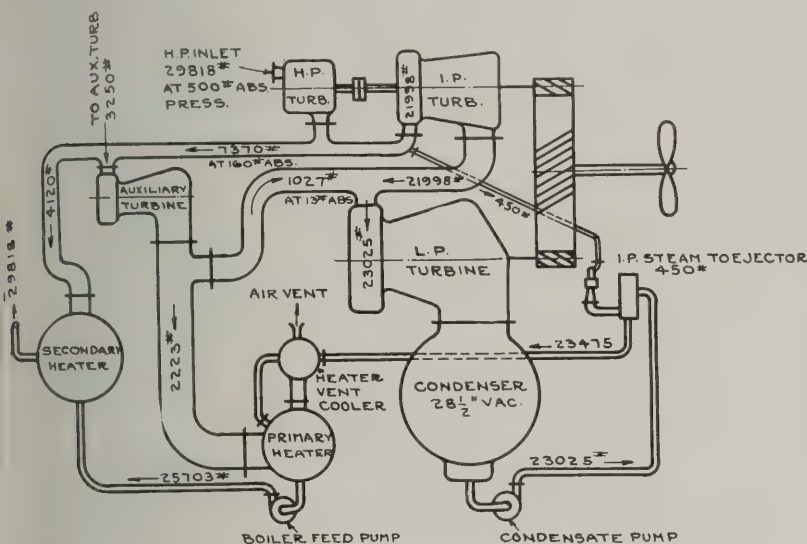


Fig. 7

The auxiliary power generating unit and the ejector would take their steam from the exhaust of the high pressure turbine and would in turn exhaust through a feedwater heater to the inlet of the low pressure turbine (Fig. 7). There would also be a feedwater heater in parallel with the inlet of the auxiliary turbine, taking its steam from the exhaust of the main high pressure turbine. The auxiliary turbine would be equipped with an automatic valve, which in case of shutting down on the main unit, would admit boiler steam directly and thus prevent any interruption of service due to sudden maneuvering of the main unit. This valve could also be actuated by hand so that during maneuvering of the main unit, the auxiliary unit would be operated independently.

Example 6 shows the probable consumption from such an arrangement:

Example 6—Fig. 7

600 pounds boiler pressure, 200 degrees F. superheat.
Auxiliaries driven by motors.
Auxiliary power generated by turbine receiving steam from main unit at end of first stage, exhausting to heater and inlet of low pressure stage.
Two-stage feed heating.
Allow 115 pounds drop to main turbines.
Inlet pressure, main turbine, pounds per square inch absolute, 500.
Total heat in steam above 32 degrees F.—British thermal units per pound, 1,352.
Exhaust of high pressure turbine, pounds per square inch absolute, 160; temperature, 364 degrees F.
Exhaust of intermediate pressure turbine, pounds per square inch absolute, 13; temperature, 236 degrees F.
Vacuum in low pressure turbine exhaust, 28½ inches; temperature, 92 degrees F.
Percent total work done in high pressure = 25 or ¼ of total.
Percent total work done in low pressure = 33⅓ or ⅓ of total.
Steam consumption—main unit with no bleeding or heating, 8.10 pounds per shaft horsepower hour
or a total of $8.10 \times 3,000 = 24,300$ pounds per hour.
Auxiliary unit taking steam at 160 pounds absolute (and 160 degrees superheat)

exhausting to 13 pounds absolute will have a steam consumption of 31 pounds per kilowatt.

Total steam consumption of one turbine = $105 \times 31 = 3,250$ pounds per hour.

(Note—Amount of circulating water greatly reduced.)

Condensing type ejector..... 450 pounds per hour

Total 3,700 pounds per hour

Let X = steam per hour from auxiliary turbine exhaust not used in primary heater into low pressure inlet of main turbine.

Let Y = steam per hour bled from intermediate pressure inlet to auxiliary turbine and secondary heater,

then $3,700 - X$ = amount of steam used in primary heater.

$Y = 2,700$ amount of steam used in secondary heater.

$$\text{High pressure steam to main turbine} = 24,300 + \frac{3Y}{4} - \frac{X}{3}$$

(For every pound bled out at 160 absolute $\frac{3}{4}$ pound must be added to go through whole of main unit to do the work required.)

$$\text{Steam to condenser} = 24,300 - \frac{Y}{4} + \frac{2X}{3}$$

The primary heater heats from 90 degrees to 206 degrees F. for 116 degrees,

$$\text{then } 1,000 (3,700 - X) = \left(24,300 - \frac{Y}{4} + \frac{2X}{3}\right) \times 116$$

$$\text{or } X = 816 + 0.027Y$$

Feed to secondary heater equals steam to condenser plus

$$3,700 - X \text{ equals } 28,000 - \frac{Y}{4} - \frac{X}{3}$$

The secondary heater heats from 206 degrees to 364 degrees F. = 158 degrees,

$$\text{then } 1,000 (Y - 3,700) = \left(28,000 - \frac{Y}{4} - \frac{X}{3}\right) \times 158$$

$$Y = 7,820 \quad Y - 3,700 = 4,120 \text{ pounds}$$

$$X = 1,027 \quad 3,700 - X = 2,673 \text{ pounds}$$

Total steam to high pressure unit = $24,300 + 5,860 - 342$ equals 29,818 pounds per hour.

The total heat of the steam = ... 1,352 British thermal units

The temperature of feed 364 degrees.

The British thermal units of liquid in feed — ... 336

Heat added to make steam = ... 1,016 British thermal units

British thermal unit rate = $29,818 \times 1,016 \div 3,000 = 10,100$

With economizers, air heaters and superheaters, a boiler efficiency of 87 percent can be counted on.

Therefore, the fuel consumption based on a heat value of 19,500 British thermal units per pound equals

$$10,100 \div (19,500 \times 0.87) = 0.595 \text{ pound oil per shaft horsepower hour.}$$

CHAMBER OF COMMERCE MEETING.—At the eleventh annual meeting of the Chamber of Commerce of the United States, to be held in New York, May 7 to 11, "Transportation in all its phases in the United States" and "Europe's Affairs" will be the main topics of discussion.



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Stern View of 250-Ton Floating Crane Kearsarge



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Former United States Battleship Kearsarge Converted Into Crane Ship at Philadelphia Navy Yard. The Crane Installed On This Hull Has a Capacity for Lifting 250 Tons



Motorship Californian of the American-Hawaiian Steamship Company

Are Motorships the Most Economical Type of Vessel?

Comparison of Fuel Costs With Coal and Oil Fired
Steamers Explains Growth of Motorship Building in Europe

By Our Special London Correspondent

THERE still remains a suspicion in the minds of many shipowners that a large proportion of the statements made relating to the economies which it is possible to effect by employing oil engines for ship propulsion are not founded on facts but are mere estimates which may, or may not, be borne out in actual practice. In dealing with the subject, it is therefore of the first importance to give some information relating to the fuel consumption of corresponding steam and motorships, attained during the course of normal service and under similar conditions.

It has to be borne in mind that it is not a sufficient inducement to the shipowner to become the advocate of the oil engined vessel merely to show a certain reduction in fuel bill as compared with the steamer. The initial cost of a motorship is considerably higher than that of one fitted with a steam engine, and the economies effected in operation must therefore be of sufficient magnitude to wipe off the additional expenditure in the course of a few years. For instance, it will be found that at the present time a good type of 10,000 ton (deadweight) motorship designed for 10½ or 11 knots at sea will cost between £130,000 and £140,000 whereas a steamer can be obtained for about £100,000. Therefore, there will be little advantage to the shipowner in employing oil engined vessels unless he can be assured of a saving in operating expenses of at least £3,000 annually. Indeed, this amount would

scarcely be a sufficient inducement for adopting the motorship.

FUEL CONSUMPTION RECORDS

In order to elucidate this problem some tables have been

The Shipping Board has in its possession a large number of vessels having good hulls in which inefficient propelling machinery is installed. These ships are of no value as they are but they may be converted into first class motorships under the plans now being developed by Admiral Benson at a cheaper cost than similar vessels could be constructed anywhere else in the world. The difference in first costs between steamers and motorships and the fixed charges thereon have been the principal reasons why motorships have not been developed to a greater extent in this country. But now that good hulls are available for conversion at a price reported to be between \$5 and \$10 a ton shipowners have an opportunity that will never be repeated to acquire vessels that will save them money by materially decreasing their fuel bill and by increasing their freight revenue through larger carrying capacity.

prepared to show the fuel consumption of various types of ships. These details, which are given below, relate to the average speed and daily fuel consumption obtained over long periods, in many cases representing a series of voyages up to a total of 100,000 miles, or two years' operation. In no case are they given for merely short runs or are they the results obtained on trials, and it is a notable fact that in practically every case, the amount of fuel required after a year or two's service is found to be somewhat lower than when the vessel is first placed in commission.

The next table gives a comparison between a steamer and a motorship of almost identical size, tonnage and speed. The figures relating to the steamer are official and are extracted from a paper read in March before the North East Coast Institution of Engineers and Ship-

builders.* This steamer is one of the most economical type afloat, being fitted with steam turbines and double-reduction gearing. A boiler pressure of 200 pounds per square inch is used, and the steam is superheated to 200 degrees Fahrenheit. An ordinary reciprocating engined vessel would have

*"Notes on the Economical Performance of Turbine Installations in Merchant Ships" by T. G. Potts.



Single Screw Cargo Motorship Yngaren, of 9,350 Tons Deadweight, Built and Engined by William Doxford and Sons for Transatlantic Steamship Company, of Gothenburg

a fuel consumption approximately 15 percent higher and, the result given probably represents the best that can be obtained with a steamship of this size. The average speed and consumption relate to 16 voyages, totaling about 50,000 miles.

The motorship, with which comparison is made, is the *Yngaren* and the figures are those given by Mr. Madsen, the superintending engineer of the Transatlantic Company (the owners of the vessel) in a paper before the Institute of Marine Engineers.† In this case, also, the results are those over a number of voyages of long duration.

It will therefore be seen that with the most efficient steamer afloat, the amount of coal consumed is $3\frac{1}{2}$ times the oil required for a motorship of the same size and slightly higher speed. We may therefore assume that with the average class of steamer the amount of coal required is quite four times the oil burned in the Diesel engines of a motorship. It should, perhaps, be added that in this motor vessel bunker oil is utilized, of the same grade as that burned under boilers.

COMPARISON OF FUEL COSTS

The *Yngaren* takes on her oil at the Panama Canal, where the cost is about £2 per ton, giving a daily fuel bill of £21.12.0. The average price for coal throughout the world is about £2 per ton, giving a fuel bill for the steamer of £75.8.0 and showing a saving of £53.16.0 per day in favor of the motor vessel. Even allowing for bunker coal obtained at 30/- per ton, (which is nearly the lowest possible price) the steamer's fuel bill will be £56.12.0 showing a saving of £35, or between £8,500 and £9,000 per annum.

If we make the comparison between oil fired steamers and motorships, the results are equally striking. Some time ago, the Fuel Conservation Committee was authorized by the United States Shipping Board to carry out some trials on the oil fired steamer *President Polk* and her sister ships. These vessels are 502 feet between perpendiculars with a beam of 62 feet, and it was found that the average results showed a speed of 13.9 knots on a daily oil consumption of 89.6 tons.

There are about a dozen motorships of approximately the

FUEL CONSUMPTIONS OF MOTORSHIPS

Motorship	Deadweight, Tons	Aver. Speed, Knots	Daily fuel Consumption, Tons
<i>Bullaren</i>	11,000	10.8	10.90
<i>Falstria</i>	7,500	10.0	8.00
<i>Buenos Aires</i>	9,400	11.0	10.50
<i>Glengyle</i>	10,000	11.5	10.30
<i>Glenary</i>	10,000	11.5	10.68
<i>Lobos</i>	10,000	10.6	10.30
<i>Glenluce</i>	10,000	10.0	10.60

COMPARISON BETWEEN A STEAM AND MOTOR SHIP

	Double Reduction Gearing Turbine Vessel, 200° F. Superheat	Motorship <i>Yngaren</i>
Length	425 feet	420 feet
Beam	55 feet	54 feet
Load draft	25 feet 6¼ inches	25 feet 6 inches
Gross tonnage	5,494	5,247
B.H.P. at sea	2,750	2,700
Speed, knots	11.12	11.2
Fuel Consumption per day, tons	37.7 (coal)	10.8 (fuel oil)

same size and speed now in service, such as the *Glenary* owned by the Glen Line and the *Lochkatrine* and *Lochgo* operated by the Royal Mail Steam Packet Company. Over long voyages, the daily fuel consumption of these vessels works out at 21 tons with a speed of 13 knots. Admitted this is a somewhat lower speed than that of the *President Polk* but the amount of oil consumed is actually less than one fourth of that required in the steamers.

FUEL COSTS AT CURRENT PRICES

It will be agreed from the figures given in the first table that a 10,000 ton motorship with a speed of $10\frac{1}{2}$ or 11 knots will have an average daily consumption of not more than $10\frac{1}{2}$ tons. A corresponding oil fired steamer burns about 30 tons daily. Accepting these figures, an interesting comparison can be made between fuel costs of the two classes of ship, at current prices for fuel oil and Diesel oil.

† "Internal Combustion and Economy," by Tage D. Madsen.

Taking New York as the bunkering port, the quotations for fuel oil and Diesel oil, at the time of writing, are respectively 42/- and 53/- per ton. This gives a daily fuel bill of £64.10.0 for the steamer and £27 for the motorship. In London, the corresponding prices for oil are 65/- and 80/- per ton, so that a steamer bunkering at London would have to pay £97 for its fuel per day, against £42 for a motorship. A coal fired steamer would burn not less than 38 tons daily, and with bunker coal at 32/- and 35/- per ton at New York and London respectively, the daily fuel bill of a vessel bunkering at one or other of these ports would be £61 and £67.

It would seem from these facts that, at any rate for average cases, the additional expenditure on the motorship is well warranted. Each case must necessarily be analyzed on its merits, but it must always be remembered that, owing to the wide radius of action, the motorship can carry sufficient fuel in double bottom tanks for very long voyages and is able to choose the port at which it will purchase fuel. In other words, the motor vessel has better opportunities for obtaining a cheap supply than either the oil fired or coal fired steamer.

MOTORSHIP CAN CARRY MORE FREIGHT

Even when a good margin is allowed in this respect, the

motorship is still able to carry a larger freight than the steamer owing to the reduced weight of the fuel and this is, of course, particularly noticeable in the case of comparisons with a coal fired ship. This fact must not be lost sight of when comparing the prices of steamers and motorships of the same dimensions.

It may be added that in connection with a 22,000 ton motor liner which is now being built by the Fairfield Company for the Union Steamship Company of New Zealand, Mr. Traill, the engineering manager of the building firm, stated that owing to the adoption of internal combustion machinery the passenger accommodation has been increased 18 percent beyond that which would be possible on a steamer of the same size and speed.

It may be asked whether the economies outlined above are not offset to some extent by a larger repair bill in the case of the motor vessel. It may definitely be stated that this is not the case, and that the average motorship has a repair bill little, if any, higher than that of the reciprocating engined vessel and probably a good deal lower than the cost involved with a geared turbine ship.

No better instance of this can be afforded than the results which have been publicly announced concerning the operation of the *William Penn*, the repair bill of which, for a whole year's service, only amounted to something like \$100.

British Shipyards Get String of New Contracts

Individual Shipowners Going Ahead—Both the Shipbuilding and Shipbreaking Outlooks Are Getting Much Brighter

By W. H. Wendon

THE past month has been characterized by a remarkable divergence of opinion as to whether the shipping depression has really touched bottom, or whether that deplorable condition has yet to arrive. One is, indeed, tempted, the risk of being dubbed "slangy," to express the conviction that shipowners—and in this connection I include shipbuilders and engineers—in the words of the popular song: "I don't know where they are." Whatever the immediate or distant future may hold, however, there is no denying the fact that shipping has of late received a decided fillip as regards exports, but, so far as one is able to judge, this is almost entirely due to the stoppage of German mining on the Ruhr, following the occupation by the French. This branch of the shipping trade is, therefore, experiencing a "boom" time—the moment; but the experts are generally agreed that, as soon as reconciliation is reached on the Ruhr, the influx of orders will be suspended, with a consequent relapse in the shipping trade. Briefly, then, the effect of the Ruhr situation has been to create a sudden artificial demand to fill the gap left open by the cessation of production in the great German coal area. The result has been an abnormal rise in the price of British coal, and the advantages accruing to shipowners have been to some extent offset by the increased cost of bunkers.

IT TIME FOR SHIPOWNERS TO ORDER NEW VESSELS?

The principal point of discussion between shipowners and shipbuilders at the moment, however, is in regard to the question. Have shipbuilding costs fallen to an irreducible minimum? Accordingly, can shipowners now step in and order vessels whereas formerly they had to tread warily in this delicate matter? Mr. J. C. Gould, who occupies the rather unusual position of being shipowner, shipbuilder and engineer,

believes beyond the shadow of a doubt that the end of the shipping depression has been reached, that, in fact, it has been passed, and that the shipping trade is now on the upward trend as regards cheaper constructive costs. Wages, he feels, cannot be further reduced, and he is convinced that the price of steel can go no lower. Summed up, therefore, his conviction is that shipowners are only wasting time if they now refrain from ordering new tonnage.

Without for one moment attributing to Mr. Gould the art of being two-faced, one has obviously to bear in mind that, in expressing his views in this manner, he may be—I do not suggest he is—obsessed by the knowledge that he is a shipbuilder, and, therefore, that from the point of view of a shipbuilder, the educating of shipowners into a contracting frame of mind is by no means undesirable. Anyhow, time alone can prove the correctness of his forecast that pronounced improvement in trade is only a few months off. Incidentally, Mr. Gould is not alarmed at the possibility of America throwing seventeen hundred ships on the market, because, in his opinion, "half these ships could never be operated, and the balance would never be operated at a profit."

In contrast to Mr. Gould's optimistic utterances, it is interesting, if not instructive, to note that Mr. Lawrence Holt, a director of the Blue Funnel Line (Messrs. Alfred Holt and Company, Liverpool), speaking at the launching of the twin-screw geared turbine steamer *Patroclus*, placed in the water for his company, stated that he regards this vessel not as a commercial proposition, but as representing an act of faith in the future, she having been built out of the profits of the past in the hope that better times will come. Mr. Holt appreciates what shipbuilders have accomplished in the matter of reducing costs of construction, but says that, even at present reduced costs, shipbuilding cannot possibly flourish. His

views are, therefore, in direct contradiction to those of Mr. Gould, who, as I have indicated above, considers that it is out of the question for shipbuilding costs to be further reduced.

DIESEL ENGINE PRICES WILL HAVE TO BE REDUCED

Sir Walter Runciman, chairman of the reorganized Moor Line (the original Moor Line, it will be recalled, was voluntarily wound up after distributing a handsome return to the shareholders consequent on the sale of the fleet at "boom" values), is more than a little inclined to draw the same conclusions as Mr. Holt, for the Moor Line is ready to give more orders when, in the opinion of Sir Walter Runciman and his co-directors, "prices come again to an economic level." The Moor Line directors, be it added, have also come to the conclusion that the original price of Diesel or other internal combustion engines will have to come much nearer the price of steam engines before they can regard the change as commercially justified.

SHIP BREAKING OUTLOOK BRIGHTER

Apropos the general shipping situation, the question of scrapping obsolete or semi-obsolete merchant vessels is again to the fore, and, as was the case two years ago, the prime mover in the discussion is Lord Kysant, better known, perhaps, as Sir Owen Phillips, which was his title until he was recently elevated to the peerage. When Lord Kysant, in his then capacity of President of the Chamber of Shipping of the United Kingdom, broached this subject two years ago, he urged the necessity of shipowners doing everything in their power to revive the ship breaking industry, which during the war had passed out of existence, consequent on every vessel, whatever her age or character, being required to offset the effects of the submarine sinkings.

Two years ago, however, the cost of breaking up a vessel was greater than the value of the material when scrapped. Lord Kysant was then, as he himself describes it, thought to be "speaking in the wilderness," but times have changed, and it is understood that this old trade is now reviving, if not in the United Kingdom, at least in other countries. A beginning has already been made in the breaking of vessels, but the presence in harbors all over the world of idle vessels of varying ages and in doubtful condition is obviously a factor on which the adherents of the break-up policy wish shipowners generally to ponder.

HIGH BOOK VALUES PREVENT SCRAPPING

It is a fact, however, that, although there is, under the British flag, a large amount of tonnage which, by reason of age, must be considered as fit for the scrap heap, there is very little offering for sale to ship breakers. The reason, however misguided, is not far to seek: It lies in the fact that the many boats acquired when prices were high still stand in the shipping companies' books at enormous figures, and the owners are not unnaturally reluctant to sell the vessels at knock-down prices, thus automatically writing off vast capital sums. They prefer, at all events for the present, to hold the vessels in the hope that the not too distant future may produce a general "boom," if only in miniature, when their losses would be mitigated.

STRING OF NEW CONTRACTS PLACED

It must not be imagined from the foregoing paragraphs that the air of gloom pervading the shipping atmosphere has dispelled the desire of shipowners, as individuals, to augment their fleets. Indeed, the reverse is the case. The past month has seen the placing of a string of new orders, ranging from large motor liners to the humble coaster. Major interest, perhaps, attaches to the contract placed by the Swedish-American Line, of Gothenburg, with Sir W. G. Armstrong, Whitworth and Company, of Newcastle, for a motor liner of

17,000 tons gross, and to have accommodation for 1,600 first, second and third-class passengers.

This vessel, which is intended for the company's passenger and cargo service between Gothenburg and New York, will be propelled by twin-screws driven by double-acting four-cycle motor engines of an entirely new type, developing 1,500 shaft horsepower, and intended to give the vessel a speed of $17\frac{1}{4}$ knots. The motors, which are the first of this type to be built, will be delivered by Messrs. Burmeister & Wain, of Copenhagen, and are considered to be the greatest advance in Diesel engineering hitherto entered upon.

Then, Messrs. Vickers, of Barrow, have received from the Donaldson Line, of Glasgow, an order to build a cargo and cattle liner, to have a length of 400 feet and to carry nearly 8,000 tons of cargo. There will also be provision for several hundreds of store cattle. This boat will operate between Liverpool, Glasgow and Canadian ports, and will be propelled by internal combustion engines of the Vickers' standard patent four-cycle solid injection type, developing about 3,000 horsepower upon a single shaft. This Donaldson liner will, when completed, be the first Diesel cattle and cargo liner on the North Atlantic.

JAPANESE CONTRACT FOR MOTORSHIPS

Other vessels to be built include two motor cargo boats each of about 10,000 tons deadweight, contracted for by Nippon Yusen Kaisha. One is to be built by Messrs. Harland and Wolff in their Govan (Glasgow) shipyard, and the other by Messrs. Lithgows, of Port Glasgow. The Furness Shipbuilding Company, of Haverton Hill, are to build a cargo liner of 8,000 tons for London shipowners. She is to be fitted with Diesel engines of the Sulzer type by Wallsend Slipway and Engineering Company. The design power is 1,800. Messrs. Andrew Weir and Company, of London and Glasgow, have ordered three cargo vessels from Messrs. Harland and Wolff, of Govan. They will have internal combustion engines, constructed at Messrs. Harland and Wolff's Diesel engine works at Glasgow. Messrs. William France, Fenwick and Company, Ltd., London, have ordered four steamers of about 3,300 tons each, two from Messrs. Vickers and two from Sir James Laing and Sons, Sunderland. The Blythswood Shipbuilding Company, Glasgow, are to build two cargo steamers, of 8,000 tons deadweight each, for Messrs. R. S. Dalgliesh, Ltd., Newcastle. The contract price is stated to be £9 per ton. Messrs. William Cory and Son, London, have ordered a 3,400-ton deadweight self-trimming collier from Messrs. Swan, Hunter & Wigham Richardson, Newcastle, and Messrs. Barclay, Currie and Company, Glasgow, are to build a large cargo vessel to be fitted with double-acting Diesel engines, for London owners. Last, but not least, Mr. William L. Roxburgh, of the Coast Lines, Ltd., Liverpool, has contracted for four steamers of 250 feet in length, and has stated to be about to place contracts for another sixteen vessels of this size, in addition to a large cargo steamer. In analyzing the above list of new contracts it is as well to bear in mind that the owners concerned are mostly of the "mushroom" type—here to-day and gone to-morrow—but in nearly every instance are old-established firms or companies. It is safely to be inferred, therefore, that they at least have a certain amount of confidence in the future.

LOSSES ON AMERICAN SHIPS DUE TO FIRE.—The United States Steamboat Inspection Service in its yearly (1921-1922) report shows that 21.4 percent of last year's marine property losses on American ships were due to fire. Consulting the previous reports the toll paid to fire during the past eleven and one-half years amounted to 13.4 percent of all property losses. Excluding our war years in which other losses were abnormal the remaining period charges fire with 15.7 percent.

Fourth British Built Motor Passenger Liner Fitted With Diesel Engines Just Commissioned

New Vessel Is Similar to Steamers Owned By Same Company,
Giving Excellent Opportunity for Valuable Economic Comparisons

By Our London Correspondent

THE development of the motor passenger liner has been one of the most interesting features in British ship-building during the past few years. There are now three oil engined passenger ships in regular service, and although they are not of very large size, the satisfactory nature of their performance has led to orders being placed for motor liners up to over 20,000 tons-gross.

A fourth vessel of the same class has just been commissioned. She is named the *Dumana*, and was built on the Clyde by Barclay, Curle & Company for the British India Steam Navigation Company for their passenger and cargo service between London and Bombay.

She is what may be termed an intermediate class of ship with a speed at sea of just under 13 knots, a cargo carrying capacity of about 11,000 tons, and accommodation for between 130 and 140 first and second class passengers. The three previous liners which have been referred to are the *Adda* and the *Aba* (vessels of 9,000 tons-gross with accommodations for about 330 passengers, engaged on the run between Liverpool and the West Coast of Africa) and the *Domala*, which is very similar to the *Dumana*, and was built for the same owners.

ELECTRIC WINCHES USED

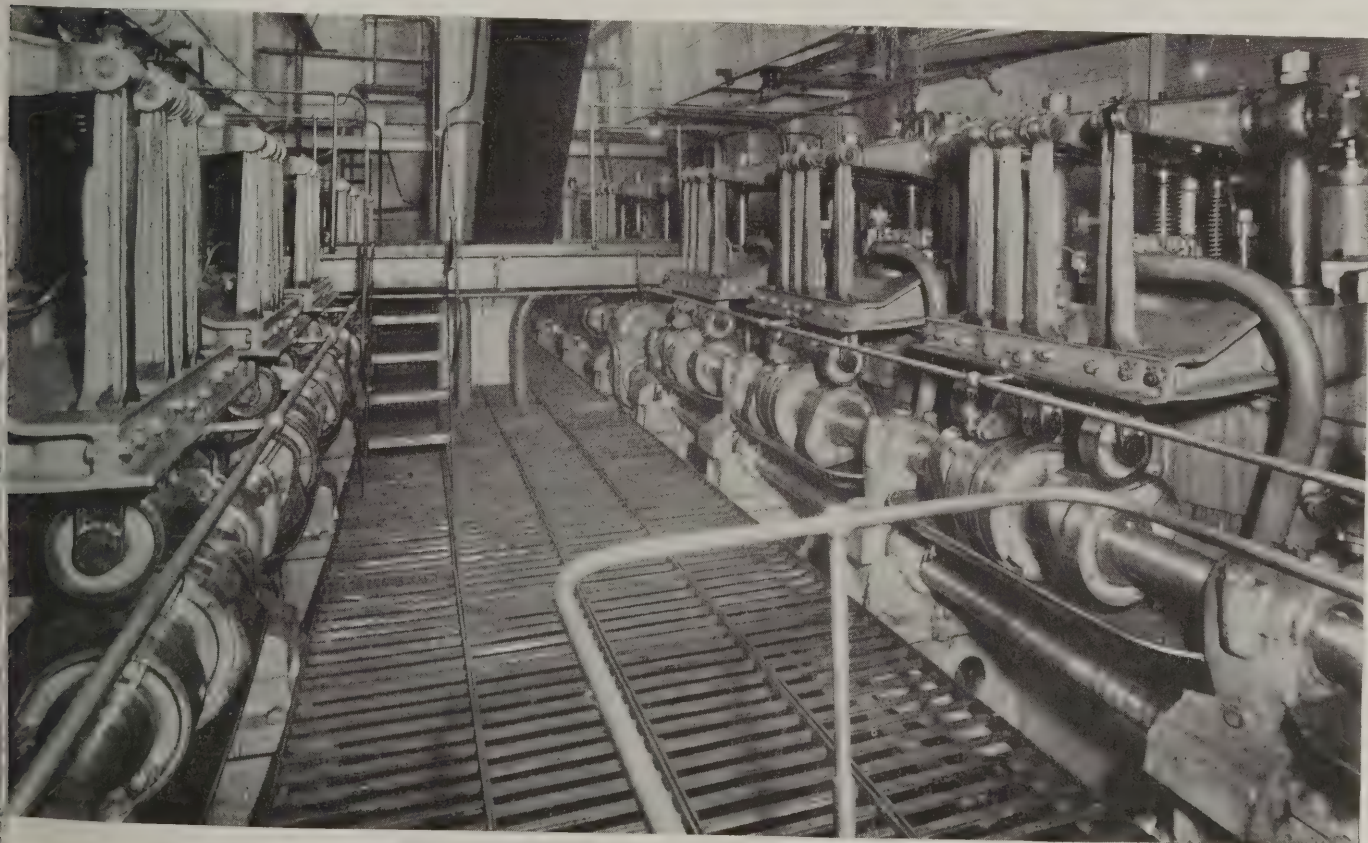
Apart from her machinery, the *Dumana* is a type of ship well known to travelers to the East. The cargo is carried

in three holds forward of the engine room and three aft, served by twelve electric winches, some of three tons' capacity and the others of seven tons.

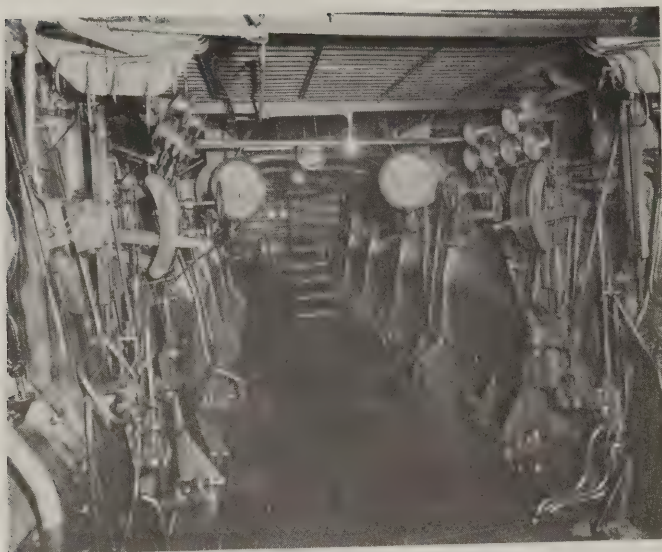
It is noteworthy that in the majority of the more recent European motorships, electricity is used for operating the winches, as well as for most of the auxiliary machinery in the engine room. Admittedly, this adds somewhat considerably to the first cost, while the weight of the plant is higher than when steam machinery is employed. Nevertheless, the economy in fuel is so large that when ship owners have had experience with both electrical and steam auxiliaries, they seem invariably to prefer the former type. It is stated, for instance, that on the *Dumana* only one-tenth of the amount of fuel will be used for the auxiliaries as compared with that required if the whole of the plant were steam driven.

STRIKING FUEL COMPARISON FOR SIMILAR SHIP

The saloons and passenger cabins in the new ship are arranged on exactly the same lines as in a corresponding steamer. Incidentally it may be mentioned that the owners have several vessels of the same class equipped with reciprocating steam engines and geared turbines. The coal consumption of these vessels usually averages about 70 tons daily, while when oil firing is utilized, the amount of fuel needed is 45 tons. Against this, the motor liner of the same dimensions and slightly higher speed consumes between 17



Motorship *Dumana*, Top Platform Showing Valve Gear



Motorship Dumana, Starting Platform Looking Forward

and 20 tons of oil daily for all purposes, the former figure being usually attained on normal runs.

The passengers are berthed in cabins on the upper and bridge decks. Normally there is accommodation for 88 first and 41 second class passengers, but as is usual with the British India Steam Navigation Company's vessels of this class, some of the cabins can be altered so that the number of first class passengers carried may be increased or diminished as required. They are mainly two and three berth cabins, all arranged with direct access to the side of the hull, so as afford natural lighting in each room. At the forward end of the upper deck is the dining saloon with a large number of small tables, and at the after end is the second class dining saloon. Forward of the promenade deck is a first class music room and a separate smoking room, while aft is the second class smoking room. Officers and engineers are both berthed on the boat deck, the latter being at the after end. This system of having the engineers and officers on the same deck was one of the innovations of the British India Steam Navigation Company, some years ago, and is now very popular.

MAIN PROPELLING MACHINERY

For propulsion, two four-cycle Diesel engines are installed. These are of the eight cylinder type constructed by the North British Diesel Engine Works and are of their own design, developed after the war. Each engine is rated at 2,330 indicated horsepower at 96 revolutions per minute and this is roughly equivalent to 2,000 steam indicated horsepower. There is little that is novel in the construction of these engines, which drive their own high pressure three-stage air compressors, but no other auxiliaries. Although separate piston cooling and jacket cooling pumps are provided, sea water is used for both purposes, the pressure in the case of the piston cooling circuit being of course higher than that used for cooling the cylinders.

As the *Dumana* is liable to enter rivers which are extremely muddy and there is a possibility of a considerable amount of deposit being drawn through the circulating system, arrangements are made whereby the piston cooling pumps draw the sea water through a special tank provided with filters. The main reason why some Diesel engine manufacturers (as, for instance, Harland & Wolff) employ fresh water cooling for the pistons is because of this danger of muddy water and not on account of the possibility of salt being deposited in the cooling spaces in the pistons as is sometimes imagined.

The arrangement of the auxiliary machinery in a motorship affords an interesting study, since each individual

builder seems to have a different idea of the needs of the case from that of other manufacturers. As previously mentioned, electricity is used for practically all purposes on the *Dumana* and the supply is derived from two generating sets, each of 215 kilowatts and driven by a six cylinder engine running at about 375 revolutions per minute—a rather high speed for marine work. The voltage of supply is 220, as usual, and this is used both for lighting and power, whereas on most Scandinavian motorships, a rotary converter is installed reducing the pressure to 110 volts for lighting.

Most British builders are in favor of having a high powered maneuvering air compressing plant, and the *Dumana* affords an excellent example of this tendency. There are two auxiliary three-stage air compressors; one is coupled to an electric motor developing 250 brake horsepower, while the other is driven by a six cylinder Diesel engine of the same power as that coupled to the two electric generators, namely 300 brake horsepower. The total power for driving these auxiliary compressors is therefore no less than 550 brake horsepower which certainly seems somewhat heavy on a vessel where the propelling plant develops well under 4,000 brake horsepower.

On the trials, a speed of approximately $13\frac{1}{2}$ knots was attained.



Single Cylinder, Double Acting, Four Cycle 1000-Brake Horsepower Experimental Diesel Engine Built by Burmeister and Wain and Operated for Four Months in Their Experimental Shop at Christianshavn

Study Insurance Problems to Prevent Losses

By "Bordereaux"

Marine insurance is one of the greatest economic factors in the shipping industry. Without it ocean commerce could hardly exist. It is a guaranty against loss from legitimate sea perils, many of which are unpreventable. Pilferage, unseaworthiness, overloading and nefarious practices, however, can be reduced to a minimum not only lowering the cost of insurance but in many cases preventing total losses; for the courts do not always decide against the underwriters.

RESPONSIBILITY of carries for pilferage losses is pressing again to the fore. There seems to be something of a revival in this class of depredations. Merchants are complaining of rifled cases in practically every trade route, and especially as regards Mexico and South America. The Mexican situation is particularly bad. Investigations by underwriters have uncovered a serious condition at Vera Cruz and other ports in Mexico, everything pointing to a systematic conspiracy on the part of customs authorities at Vera Cruz and unscrupulous merchants at Mexico City to rob merchandise while in transit through the customs.

Chile has produced the latest device designed to curb theft and pilferage, the plan being to place on ship captains the responsibility for missing or underweight packages. United States Consul George A. Makins, at Valparaiso, refers to it in his recent reports. He says: "The Chilean customs ordinance (Art. 89, Paragraph 3) provides that a fine may be imposed on the captain of the vessel where cases are found to have been opened or their contents removed without the written permission of the customs authorities. In a recent case at Valparaiso, where it was found that 460 parcels of cargo had had their contents stolen before being discharged, a fine of 5 pesos per package was imposed on the captain of the vessel. The steamship company moved for dismissal, arguing that this was a distortion of the intent of the law. The decision was contested and brought before the Chilean Supreme Court, which upheld the original decision and ordered the captain of the vessel to pay the fine."

Importance of Dunnage

ACCORDING to a recent decision of the United States District Court, S. D., New York, 285 Fed. Rep., 612, under the Harter Act ship owners are under obligation to furnish seaworthy vessels, and grain-carrying ships must be properly dunnaged to protect cargo from water damage. This was a suit in admiralty brought by the Midland Linseed Products Company against the schooner *Oakley C. Curtis* and the France and Canada Steamship Corporation, on a libel to recover \$146,000 damages to a cargo of linseed transported from Buenos Aires to New York. The court ruled against an extension of the Harter Act as contended by the respondents to the effect that they warranted the seaworthiness of the vessel in so far only as ordinary care can provide and that the vessel was relieved only from liability arising from an act of God, perils of the sea, etc. It was shown that the hull was entirely seaworthy but that the trouble lay with the dunnage, which was improper and insufficient.

In the matter of dunnage it was proven that the pieces of boards used for sealing the sides of the vessel had no protecting sidepieces, as they should have had, and that the boards were spaced too far apart, with the result that many linseed bags pressed or pushed into the spaces and against the ceiling or skin of the ship. The consequence was that the bags and their contents in the lower hold were wetted during the heavy seas that prevailed. Furthermore, air strakes and spaces between the beams extending into the bilges were not securely covered, as they should have been, and loose grain

was, on that account, enabled to sift to the bilge between the timbers of the vessel, clogging the pumps and preventing the pumping out of the hold. As to water coming in at the sides, the respondents were deemed liable for damage from this source, since it was shown that if the 'tween-deck and the lower hold had been properly sealed or dunnaged the water would have passed into the bilges and would have been pumped out.

Lightning a Sea Peril

A WEEK or so ago the steamer *Albania* arrived in New York with word of having narrowly escaped being struck by lightning while in mid-ocean, and the consequence has been a revival of the perennial question "Is Lightning a Sea Peril?" Oddly enough, there appears to be doubt in many quarters as to the propriety of including lightning among perils of the sea, the argument being that lightning is no more such a peril than rain and that there is nothing of an extraordinary character to it and that it is in no wise peculiar to the sea. In this connection it is interesting to recall the views of the Supreme Court of South Carolina, in the recent case of the Clinchfield Fuel Company vs. the Aetna Insurance Company, as regards the meaning of perils of the sea.

This was an action brought by the fuel company against the insurers to recover for the loss of a cargo of coal shipped per steamer *Northwestern* from Charleston, S. C., to Cuba. The vessel was of wood, built in 1881 and twice rebuilt. On the passage she encountered heavy winds and cross seas, and on the third day out she was beached in order, if possible, to save the crew and cargo. She soon broke up, however, and with the cargo was a total loss. In the course of his opinion the presiding judge observed of the term "perils of the sea" that it is a phrase interpreted with great strictness in connection with bills of lading but with surprising elasticity where the assured is claiming a recovery under a policy of insurance. Such a variance of interpretation the judge admitted to be erroneous, but he held that in any event the term must be interpreted with considerable elasticity when applied to policies of insurance. The court cited authorities to show that even though a storm was not so extraordinary as to have resulted from uncommon causes yet it was unnecessary to show such a storm in order to have a claim under the perils of the sea clause in a marine insurance policy. Thus Carver, in "Carriage by Sea," says: "Upon this it must be remarked that losses need not be extraordinary, in the sense of arising from causes which are uncommon. Rough seas, which are characteristically sea perils, are common incidents of a voyage." The court quoted from the case of *The Hazard vs. Peters*, wherein it was held that "they (the underwriters) insure against losses from extraordinary occurrences only, such as stress of weather, winds and waves, lightning, tempests, rocks, etc."

While on the question of "perils of the sea" it may be well to recall the admirable working definition of this mooted phrase as given in the decision of Judge Hough, Circuit Court of Appeals, in the *Rosalie* case; 264 Fed. Rep. 285.

He therein stated that "a peril of the seas which forms a good exception in a bill of lading means something so catastrophic as to triumph over those safeguards by which skillful and vigilant seamen usually bring ship and cargo to port in safety."

Barge Canal Outlook

UNDERWRITERS and shipowners are finding much to interest them in the current news of activity as respects business on the New York State Barge Canal during the present season. All indications point to an extended use of the canal by shippers in the Middle Western States. According to Superintendent of Public Works Walsh, financial interests at Cleveland, Detroit and Duluth have under consideration a considerable investment in equipment to be used on that waterway and on the Great Lakes. Contracts have already been let by one group for two Diesel-engined, electrically-driven motor ships, each capable of carrying two thousand tons of freight on the canal draft, and it is expected that they will be ready for use by midsummer. Crude rubber importations will probably be carried by the canal to Cleveland and thence by rail to Akron, at a saving of \$2 per ton over the all-rail rate, provided adequate terminal facilities can be effected at Cleveland. Import flaxseed for Cleveland and Toledo will probably be resumed by way of the canal, running into hundreds of thousands of tons. Holland building brick is another commodity that will probably be moved to the Western market from New York via the canal.

Transshipment Problem

THE collapse of the Three Star Line has brought an embarrassing situation upon the underwriters, especially as regards the problem of a transshipment of cargoes now tied up at various points. Three of the company's steamers are now detained at widely separated ports—the *Bacchus* at Marseilles, the *Phoebus* at Philadelphia, and the *Janus* at Oran, Algiers. Urgent questions have developed in connection with the insurance carried on their cargoes, and responsibility for getting the merchandise forward to destination. On account of the financial condition of the line these cargoes have been discharged and await the further instructions of the shippers who own them. Such a situation naturally entails enormous expense upon the shippers, the freight having been prepaid and the merchandise lying scattered at remote points. No sea peril is involved and claims on that account are not entertained. Responsibility for transshipment, under ordinary circumstances, would devolve upon the carrier, but in the conditions of the present case it will have to rest with the owners of the cargoes. As regards the validity of the insurance, the majority of the underwriters concerned are maintaining that an abandonment of voyage has occurred, and that extended coverage must be applied for by the insured and secured by the payment of additional premium.

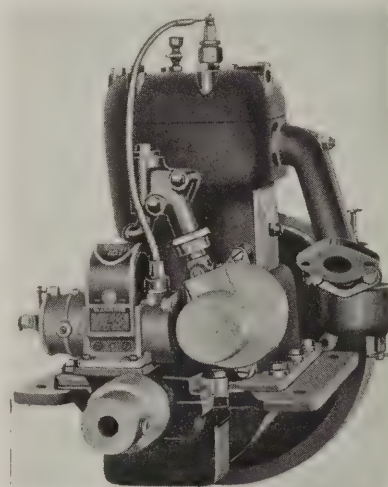
Overloading

IT is universally admitted that overloading constitutes a factor of decided danger to ship and cargo. Recent instances of it have been occasioning underwriters considerable anxiety; to such an extent, indeed, as to arouse consideration of the introduction of a clause in policies under the terms of which the policy must be warranted free of any claim incurred during a voyage on which the vessel sailed in an overloaded condition. This has been directly the outcome of repeated warnings to the effect that foreign steamers have been sailing regularly from the River Plate

with cargoes of grain loaded to a depth that submerges their load lines at least by a foot. There is nothing in the hull policy, unfortunately, to prevent an owner from overloading his vessel. In the event of a loss in consequence, the underwriter is forced to pay the bill. It will be generally admitted that something ought to be done, by underwriters if others will not take the lead, to put an end to a practice that is the outgrowth of greed and which imperils the lives of the crew and jeopardizes ship and cargo.

Marine Motor for Small Boat Propulsion

A SMALL size, low price motor, having a special feature of interchangeable parts standard to Ford motors, is being built on a quantity basis by a recently organized corporation of Detroit, the Du Brie Marine Motors. This motor is a single cylinder four-cycle 5 horsepower type weighing 100 pounds. It is



Du Brie Marine Motor

equipped with a Bosch high tension magneto, an impulse starter, a Holley carburetor and propeller wheel. This motor is also equipped for twin-screw installation with either right or left hand rotation. Forty-four of the parts of the Du Brie marine motor are interchangeable with the standard parts of the Ford automobile engines, thus making possible replacements at a minimum cost.

It is claimed that this motor is very flexible, due to the hot spot manifold and a special type camshaft. It has been demonstrated that the motor may be slowed down to 180 revolutions per minute and run at this speed indefinitely. Arrangements have been made with Chris Smith and Sons Boat Company of Algonac, Mich., builders of racing craft, to furnish plans and specifications for a 25-foot boat specially designed for use with this motor. These plans are furnished with each motor upon request.

Liability of Vessels Sold by Government

IN the case of the *Texas Company vs. United States*, 285 Federal Reporter, 643, a libel was filed against the *M. Morgan*, previously known as the *Retriever*, to recover damages for a negligent collision. At the time the cause of action arose the vessel was owned by the United States but was subsequently sold. The Court held, that the provisions of the Suits in Admiralty Act of March 9, 1920, section 5, which states that suits thereunder on causes of action arising prior to its taking effect must be brought within one year after it went into effect, does not apply to a suit in rem authorized by the Act of September 7, 1916, (Comp. Stat. sec. 8146a, etc.) against a vessel which has been sold by the government, and for which the United States assumes liability under sec. 4 of the Suits in Admiralty Act.

The Spring meeting of the American Society of Mechanical Engineers will be held in Montreal, Canada, May 28 to 31. The Engineering Institute of Canada will attend the meeting.

Current Admiralty Decisions of Special Interest

By Calvert B. Gill*

Maritime Contract With City Binding

A MARITIME contract with a city for the unloading of a sunken scow, says the Court in *Rodgers & Hagerty, Inc., vs. City of New York*, 285 Federal Reporter, can be enforced in a court of Admiralty without regard to provisions of the city charter limiting its liability on contracts, since the enforcement of those provisions of charter in a court of Admiralty would destroy the unity of the Admiralty jurisdiction that is preserved by constitution of the United States.

Damages Occurring on Dock Outside of Admiralty Jurisdiction

THE seeking to recover damages arising from a tort which occurred on a dock at which a vessel is moored, as the plaintiff endeavored to do in the case of *Spitzer & Annette Rolph*, 285 Federal Reporter, 446, the Court is without the pale of Admiralty cognizance so that exclusive jurisdiction of Admiralty is not invaded by bringing such action in a State court, and the cause is not able to a Federal court on that ground. A vessel is "citizen within the purview of the statutes authorizing removal of causes to the Federal courts, so that a cause tried in the State court by a citizen of the State against a vessel, whose home port was in another State cannot be removed on the ground of diversity of citizenship.

Enforcement of Maritime Liens Where Common Ownership Exists

THE fact that the corporation furnishing supplies to a vessel and the corporation owning the vessel had largely the same stockholders and many of the officers were identical does not make the supply corporation the owner of the vessel, nor indicate the supplies were furnished on the credit of the owning corporation, if the officers of the two corporations, by whom the supplies were sold and purchased, were different and there is no showing that the supply corporation had used its power to compel the vessel to purchase supplies from

A maritime lien is denied to a party, who would otherwise be entitled to it because of his relation to the vessel, when he is either a real part owner of the vessel, occupying a fiduciary relation toward her and her owners or deals with her on her account; that is, the lien is denied because of insuperable legal difficulties in the enforcement of the lien, because to recognize it would be inequitable to the other claimants, says the Court in the case of *the Gloucester*, 285 Federal Reporter, 579.

Obligation of Owner to Provide Dunnage

THE *Oakley C. Curtis*, 285 Federal Reporter, 612, is a case where the owner was held liable to recover damages to a cargo of grain damaged by sea water while in transit. The Court said: "It is established that a vessel beginning her voyage in a time charter party at Law, Baltimore, Md.

of year when storms at sea are prevalent, carrying grain, must install dunnage, so as to keep the cargo free from water which may reasonably be expected to enter during the voyage from strains and stress of weather or other leakage." The Harter Act, Sec. 3, does not exempt the owner of a chartered vessel from the obligation to furnish a vessel which is seaworthy and fit for the cargo to be carried at the commencement of the voyage.

Offer of Re-instatement Annuls Wrongful Discharge

A PROMPT offer of reinstatement operates to annul a hasty and wrongful discharge of a seaman, and in such case no penalty of one month's wages under Revised Statutes, Sec. 4527, is due the seaman says the Court in *The Meton*, 4 American Maritime Cases, 296, where the plaintiff was discharged after four days of employment, but was offered reinstatement the same day he was discharged, which he refused.

Recovery for Supplies Furnished

A MARITIME lien, under the act of June 23, 1910, sections 1-3," says the Court in the case of *El Amigo*, 285 Federal Reporter, 868, in which the plaintiff endeavored to recover for supplies furnished to a ship while under a charter party but was held out as being owned by the parties ordering the supplies, for supplies furnished a foreign vessel "is not defeated by showing that such person was charterer, without authority to bind the vessel, where those furnishing the supplies had no knowledge or means of knowledge of such facts." That the charging of the necessities against the person ordering them does not affect the furnisher's right to a lien where the necessities are furnished under circumstances giving rise to a lien.

Breach of Charter Party

IN the case of *Galban Lobo & Company vs. United States*, 285 Federal Reporter, 665, wherein the plaintiff brought suit in Admiralty in personam for damages flowing out of a breach of a charter party. The plaintiff being a Cuban corporation without a residence or principal place of business in this country, the Court held that a suit against the United States cannot be maintained under the Suits in Admiralty Act of March 9th, 1920, section 2, by a non-resident having no place of business in the United States, where the cause of action alleged would not support a suit in rem. The clause in the statute permitting suit to be brought in the district in which the vessel "charged with liability is found" is also unavailing, as there could be no liability in rem where the cargo was never placed on board the vessel, and the charter was cancelled because the vessel was not in readiness to receive it. "Charged with liability" does not mean "attachable by foreign process" but charged with a maritime lien. Nor is the cancellation of a charter party by the charterer, because of failure to have the vessel ready to receive cargo, an abandonment of a claim for damages arising from expenditures for lighterage made necessary by the breach of contract.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Hot Well Salinity Indicator

Q. (1194).—Please advise if harmful electro action would be likely to occur under the following conditions: A 110-volt light circuit is so arranged that in case sea water should find its way into the hot well the salt water would complete circuit and cause a light to show. If the hot well were absolutely fresh, enough current could not pass between the terminals to cause the light to glow.—D. S. R.

A. (1194).—If the action of the light circuit was sufficiently positive and certain to indicate satisfactorily and promptly small degrees of salinity or acidity, it should be possible to relieve the conditions responsible before serious damage could be done by electrolytic action.

Why Naval Vessels Have a Clipper Stem

Q. (1197).—What is the reason for the different practice in the United States Navy as to type of stem as compared with that in the merchant service?

A. (1197).—The clipper or overhanging stem as fitted on naval vessels provides:

- (a) Satisfactory stowage for stockless anchors.
- (b) A topside shape which greatly assists in bringing the anchor snugly to its stowage position.
- (c) A location of hawse hole such that the anchor drops well clear of the fore foot.
- (d) A lead of anchor chain (particularly in the case of the center anchor) such that the danger of nipping across the stem is minimized.
- (e) A natural ending, without extreme snubbing, to the vessel's topside waterlines in spite of the rather excessive flare generally used.

In the merchant service the vessels do not spend the time at anchor that the naval vessel does. Speeds are lower and freeboards are greater so that the stowage of an anchor well clear of the ordinary seas is not so difficult. The shape of the sections below the waterline does not require the hawse hole to be so far from the centerline of the ship.

Which Methods Are Preferable for Calculating Displacement, Stability, etc.?

Q. (1195).—Do you consider the method for calculating displacement, stability, etc., used by the Navy Department superior to the methods which are based upon the use of the integrator?

A. (1195).—The method in use by the Navy Department is based upon the use of the trapezoidal rule for integration. This rule simplifies the numerical work but necessitates compensation for the effect of curvature when the ordinates are measured either from the cross sections for immersed area or from the curve of sectional areas for displacement.

When using the integrator the areas are obtained by the

instrument and generally "put through" Simpson's rule or some other similar rule with which the compensation necessary with the trapezoidal rule is not required.

The degree of accuracy to be expected is about the same with either method except that all figures used in the Navy Department method are entered on regular forms and are therefore, readily subject to check. Moreover, in case any question of the accuracy of the work or of the exact step taken arises, the calculations made by the department's method are invaluable for ready reference. This is not true to the same extent of the integrator methods. In the writer's experience, particularly in large organizations, in which the personnel making routine calculations are subject to considerable change, methods which can easily be reduced to definite forms and which, when carried out properly, result in accurate records of the work done are of especial value.

If the data desired are for one draft only, time will probably be saved by using the integrator. If a complete displacement sheet or cross curves of stability for a considerable range of displacement are required, the department's method would probably be shorter.

Relative Efficiency of Methods for Estimating Weights

Q. (1196).—What can you say of the relative efficiency of the several methods commonly used in making preliminary weight estimates?

A. (1196).—This is too broad a subject to be covered in this department. The following notes may be helpful in outlining it for your further investigation:

Let it first be agreed that the discussion applies only to estimates for hull proper as it is comparatively simple to make weight allowances for machinery, outfit, equipment, etc. The hull, moreover, forms a very large proportion of the weight of the ordinary merchant ship. Hence the hull weight is the principal object of the preliminary weight estimates.

These are five methods of arriving at a figure for hull weight which are generally used.

(a) Weight per linear foot of midship section multiplied by length times a constant = hull weight. The weight per foot is estimated for the ship in hand and the constant is taken from experience with other ships of the type.

(b) Length times beam times depth times a constant = hull weight. The constant is in this case also taken from other ships of the type.

(c) Recording of the weights of the hull groups such as framing, bulkheads, shell plating, etc., as curves plotted as cubic number $(L \times B \times D)$ or the numeral of a classification society. Then building up a hull weight by taking group weights off from these curves.

(d) When the group weights of a similar ship are available taking them as a basis from which to proportion weights for the new ship in the ratio of dimensions, and etc., allowances being for difference in scantlings.

(e) Lay out the principal structural members, as deck, shell, etc., to a small scale and estimate weights on an "allowance for unit area" basis.

Of course in all the above methods care must be taken to make proper allowance for special features, perhaps not covered in the type used.

The writer has used all of the above methods except (c) and found them all reasonably satisfactory, if carefully and understandingly used. It would seem that (c) would be very satisfactory when dealing with well established types for which a considerable quantity of information was available.

The writer has found (d) to be the best where a really satisfactory type ship and its data are available. When investigating a new field (e) is the best.

Methods (a) and (b) do not give as accurate results as (d) and (e) unless the data upon which they are based are exceptionally good. Methods (a) and (b) give no assistance in fixing the location of the center of gravity of the hull. Methods (c), (d) and (e) are satisfactory in this respect.

NEW BOOKS

SHIP SUBSIDIES. (Reference Shelf Series.) Compiled by Lamar T. Berman. Size, 5 by 7 $\frac{3}{4}$ inches. Pages, 112. New York, 1923: The H. T. Wilson Company.

This volume is written along the general lines of the Reference Shelf Series. The history and present status of the subsidy question and articles covering arguments for and against are included.

A feature of the book is an outline of affirmative and negative briefs suitable for a debate which should be of particular interest to schools and debating societies. The bibliography giving a long list of references to books and periodicals in which the subsidy question is discussed is also of value.

Industrial Oil Engineering

Reviewed by James A. Kelley*

HANDBOOK OF INDUSTRIAL OIL ENGINEERING. By John Rome Battle. Size, 5 $\frac{1}{2}$ by 7 $\frac{3}{4}$ inches. Pages, 1,131. Illustrations, 471. Philadelphia, 1923: J. B. Lippincott Company.

This volume is essentially a handbook on the diversified uses of oil and its scope includes, as set forth on the title page, "A Reference Book of Data, relating to lubrication and industrial oils, including tables, general oil information, engineering and industrial requirements for the use of oil engineers, oil salesmen, oil equipment manufacturers, mechanical engineers, machinery designers, mill and power plant superintendents, and others interested in the efficient utilization of oil products and equipment and the conservation of power. It includes the Lubricating Engineer's Handbook revised."

At the outset it should be stated that this work does not include data or text concerning oil burning equipment and the burning of oil. The author announces his intention of publishing a manuscript especially covering this important branch of oil engineering.

The volume is replete with data, tables, diagrams and illustrations, and covers each subject in a remarkably clear and thorough manner. For example, the author is not content with describing the lubrication of bearings but gives a great deal of valuable information about every type of bearing encountered in practice. Again, in treating the subject of lubricating forming machinery, cutting metal, etc., a great deal of instructive data is included concerning the theory of cutting operations.

A recounting of the treatment of each phase of the industry involved in core making, textile mills, etc., etc., would be too

*Naval architect, Morse Dry Dock and Repair Company, Brooklyn, N. Y.

lengthy for this review, but it is to be remarked that in each case, the subject is thoroughly treated, and every chapter speaks loudly of the author's exhaustive and painstaking research and study. It is only to be regretted that the inclusion of the oil burning field would have made this splendid volume too lengthy.

LETTERS TO THE EDITOR

Automatic Steering

It was with a great deal of interest that I read in your March issue the article by Mr. R. H. Rogers, describing the "Wake System of Automatic Steering." It certainly appears to be a simple method and to possess a considerable degree of merit, in a great measure overcoming the difficulty of personal judgment as to the leeway the ship is making.

It does that, however, only in a measure. It takes care of leeway produced by the action of the wind, or through the behavior of the ship as to its steering, but it introduces a new error, which in many cases may lead to shipwreck, if too much reliance is placed on the automatic correctness of the steering.

This is due to the fact that when crossing a water current, whether tidal or of other kind, the drag used will drift with the current and thus make the wire connecting it to the vessel form an angle with the true course made good by the vessel. This angle will depend upon the speed of the water current and the angle at which the ship crosses the same.

A little calculation will show that with currents such as are frequently found along coasts, and with ordinary speeds of ships, this introduces a very serious error, which, especially in a fog, might easily lead to disaster. If this "wake system" is used, it is therefore just as important for the navigator to exercise his personal judgment as with any other kind of steering, automatic or otherwise, and it is therefore dangerous to spread the idea that any new system such as now introduced will overcome vigil on the part of the officers of the ship.

It is true that Mr. Rogers states that cumulative errors may occur, but that is something quite different from mentioning this, in reality, very serious error that is caused through the very principle under which the apparatus operates. At any rate it would seem important enough to have attention called to it.

Los Angeles, Cal.

E. T. SEDERHOLM.

Fletcher Company Wins St. Louis Case

Suit Attracted Considerable Attention, There Being More Money Involved Than in Any Other Pending Admiralty Case

THE case of International Mercantile Marine Company against W. & A. Fletcher Company, arising out of the burning of the former American liner *St. Louis*, at the shipyard of W. & A. Fletcher Company, in Hoboken, on January 8, 1920, has been decided in favor of the W. & A. Fletcher Company by United States Circuit Judge Ward, sitting in admiralty in the United States District Court for the Southern District of New York.

The case has attracted a great deal of attention in shipping and shipbuilding circles because of the large amount of money involved, probably the largest in any admiralty case pending in the courts. While the suit was brought in the name of the International Mercantile Marine Company, the real parties in interest were underwriters, particularly British underwriters, who, the court said, properly should have been made

parties to the suit. The International Mercantile Marine Company was not itself interested in the litigation in any way.

SOUGHT TO RECOVER \$2,000,000

The underwriters had paid a total loss on the *St. Louis* of approximately \$1,600,000, and they sought to recover \$2,000,000 from the Fletcher Company, not only for the total loss of the *St. Louis*, but also for damages to the *Kroonland*, undergoing repairs at the Fletcher yard, which resulted from the *St. Louis* listing over on her while the fire was being extinguished.

The suit was brought upon the charge that the fire had been started by the negligent use of a blow torch and a volatile varnish remover, in removing varnish from the grand staircase of the vessel. The court held that the fire was not started by the use of a blow torch; that a torch was not used where libellant's witnesses had claimed, but it found that the fire was started in a piece of waste.

CONTRACT MADE INSURANCE COMPANIES RESPONSIBLE

The court also found that it was a condition of the agreement under which the work was undertaken that the Fletcher Company should not be liable for losses ordinarily coverable by marine insurance, of which fire was one. Subsequent to the time the agreement was made, the International Mercantile Marine Company, as agent of the United States Shipping Board, negotiated with the Fletcher Company and Cramp Shipbuilding Company for the repair of the *Leviathan*, and in the offer which was submitted by the Fletcher and Cramp companies there was inserted a provision that the United States would assume all usual risks on the steamer and materials delivered to the contractor, ordinarily coverable by insurance, and the court held that the offer to repair the *Leviathan* evidenced the contract covering the repair of the *St. Louis*, as the Fletcher and Cramp companies had offered to make the repairs on the *Leviathan* on the same terms and conditions as the Fletcher Company was making them on the International Mercantile Marine Company's own ships.

Messrs. Ira A. Campbell and John M. Woolsey, of the firm of Kirlin, Woolsey, Campbell, Hickox & Keating, and Clarence Bishop Smith, of the firm of Haight, Smith, Griffin & Deming, appeared for W. & A. Fletcher Company, and Messrs. Charles C. Burlingham and Chauncey I. Clark, of the firm of Burlingham, Veeder, Masten & Fearey, and Earle Farwell, of the firm of Barry, Wainwright, Thatcher & Symmers, appeared for the underwriters.

PERSONAL MENTION

BEN BARBER, for three years district counsel for the north-eastern district of the United States Shipping Board, has resigned to enter private practice in New York.

N. M. LEACH was elected president of the Steele Steamship Line at the recent annual meeting of the directors, held at New Orleans. Semmes Steele was elected vice-president.

J. V. BLAKE, assistant to W. A. Morrissey, tank steamship executive for the United States Shipping Board, has resigned to become manager of tank steamships for the Pure Oil Company.

THOMAS G. PLANT, formerly manager for McCormick, McPherson and Lapham, has been appointed operating manager of the American-Hawaiian Line, San Francisco, Cal. Mr. Plant was at one time the United States Shipping Board's assistant director at San Francisco.

C. C. JACOBSON, vice-president of the National Association of Marine Designers and formerly in the marine division of the Department of Plant & Structures of the City of New York, is now connected with the engineering department of the Atlantic, Gulf & Pacific Company, engineers and contractors, 2407 Park Row Building, New York City.

R. T. GORDON, for the past eight years connected with the New York sales office of the Alberger Pump and Condenser Company, has resigned to accept a position in the sales department of Dean Brothers Company, of Indianapolis, Ind., manufacturers of pumping machinery, and will be located in their New York office at 141 Broadway.

CAPTAIN THOMAS KIER has been appointed to the command of the new Hamburg-American Line steamship *Albert Ballin*, according to information received from Hamburg by the United American Lines who are the United States agents for the Hamburg-American Line. Captain Kier, who is commodore of the Hamburg-American fleet, has been in service with the company for thirty years. Prior to the war he was commander of the *Imperator*.

CAPTAIN JOHN BRADSHAW, commander of the new 27,000-ton Red Star Liner *Belgenland*, which recently arrived at New York on her maiden voyage from Antwerp, is an American citizen and a resident



Captain John Bradshaw

of New York City. His first command was that of the *Rhyndland*, of the Red Star Line, to which he was appointed in 1899. Since that date he has held command of the *Samland*, *Finland*, *Kroonland* and *Lapland*, the last-named from her debut in 1912 until his appointment to the new *Belgenland* in January of the present year. In command of the *Lapland* during the World War, Captain Bradshaw made seventy-four of the seventy-six voyages of that vessel as a troop transport. Captain Bradshaw had the distinction of commanding one of the first steamers to take troops from Canada to England for the conflict, as the *Lapland* was in the first convoy that put out from Montreal. She was also the first ship to bring Canadian troops home after the signing of the armistice.

E. P. ERCKENBRACK, who has been filling the position of district director of the United States Shipping Board for Brazil at Rio since February 1, 1920, has been appointed district director of the Board at Seattle, succeeding Robert M. Semmes, resigned. Mr. Erckenbrack is very well known on the Pacific Coast and undoubtedly his appointment to the office will result in increased business for Board line vessels trading to and from the Puget Sound district.

F. W. LEAHY, president of the Leahy Engineering Company, Cincinnati, O., has been appointed supervising engineer of The Campbell's Creek Coal Company. In this capacity he will have charge of both the new construction and the maintenance of all floating equipment of this company. He will also continue as president of the Leahy Engineering Company. Mr. Leahy has had many years' experience as chief engineer of ocean-going ships and is well known on both the Atlantic and Pacific coasts. Before establishing the Leahy Engineering Company he was for several years New York manager of the Diamond Power Specialty Company.

HUGH GALLAGHER, veteran of the Admiral line, has been promoted from superintendent of the company to assistant operating manager.

CAPTAIN R. C. BRENNAN, for a number of years port captain of the Admiral line, has been appointed operating manager of the company and will have charge of all physical operations of the company's extensive coastwise services.

G. H. FROEBEL, the new manager of the marine sales department of the Westinghouse Electric & Manufacturing Company, whose appointment, effective April 1, was announced in our April issue, will have his headquarters at the East Pittsburgh works of the Westinghouse Company.



G. H. Froebel

In his new position, he will be a member of the Domestic Sales Committee, composed of the heads of the various sales departments. Mr. Froebel was born at Boerne, Tex., on October 1, 1889, and was graduated from the San Antonio High School in 1907 and attended the University of Texas from 1907 to 1909. The new marine head entered the employ of the Westing-

house Company in November, 1912, taking up the company's graduate apprentice shop course. He was transferred in 1914 to the Dallas, Texas, office of the company as industrial salesman. Two years later he opened the Houston, Tex., branch office as manager of the Industrial Division for the entire district. He remained there until 1918, when he entered the United States Army, as a lieutenant in the Construction Division. After being discharged from the Army in April, 1919, he re-entered the employ of the Westinghouse Company and was placed in charge of the Houston branch office, of which he became manager in November, 1919. Mr. Froebel is a member of the American Society of Military Engineers and an associate member of the American Institute of Electrical Engineers.

WILLIAM M. KENNEDY, until recently associated with the United States Shipping Board at 45 Broadway, New York, as supervising local manager, has assumed in full the duties of assistant to Andrew Fletcher, Jr., in the direction of work at the shipyard of W. & A. Fletcher, Hoboken, N. J. Mr. Kennedy resigned from the Shipping Board to undertake the supervision of work at the Fletcher plant several weeks ago and he brings to his new connection a wealth of experience gained in more than twenty-two years' association with ships and ship construction. Starting as an apprentice with the Maryland Steel Company, Sparrow's Point, Md., he subsequently became a mechanic, supervisor of new construction, draftsman, estimator and executive in charge of estimating and planning. During this time he was employed on work at several private shipyards, including the Maryland Steel Company and the Fore River Shipbuilding Company at Quincy, Mass., as well as naval construction at the Charleston, S. C., and New York Navy Yards. In 1915 Mr. Kennedy became associated with work at the Panama Canal in an executive capacity and played a prominent part in the installation of the planning and production system used in the canal dry docks and shops. He subsequently left the Panama Canal to become assistant production manager of the Merchant Shipbuilding Corporation at Harriman, Pa., later becoming assistant works manager and then assistant

to the general manager. On April 1, 1920, he was transferred to the Chester yard of the Merchant Shipbuilding Corporation as works superintendent and about a year later resigned and became associated with the Shipping Board.

OBITUARY

GEORGE PALMER FENNER, assistant treasurer of the American-Hawaiian Steamship Company, died at his home in Flushing, L. I., recently. He was born in Brighton, England, and had engaged in the steamship business the greater part of his life.

WILLIAM W. STODDARD, the oldest employee of the New York Navy Yard, died at his home in Brooklyn, N. Y., on April 3 at the age of 87. Mr. Stoddard was a veteran of the civil war. In the Spanish war he helped to outfit naval vessels for service, and again in the world war he performed similar duty, having charge of 6,000 men at the New York Navy Yard.

ADDISON CHILDS DAMON, associated with the yacht building concern of George Lawley & Son Corporation in Neponset, Mass., died recently at his home, in Dorchester, Mass. Mr. Damon was sixty-two years old. Almost immediately upon leaving school he associated himself with the Lawley corporation, where he became an expert draughtsman and at the time of his death had been in its employ forty years.

CAPTAIN GEORGE L. NORTON, from 1885 to 1919 editor and publisher of *The Marine Journal*, died at his home in New York on March 24, at the age of 87. Captain Norton



Capt. George L. Norton

was born in Castine, Me., in 1837 and at the age of 14 went to sea. Starting at the bottom, this sturdy scion of a New England sea-faring family rapidly rose to a position of command and influence in the coastwise steamship service. At the outbreak of the civil war he was second officer of the steamship *Saxon*, which became an army transport. Later he became first officer and master of the *Saxon* and in 1866 took command of the *Ashland*, pioneer steamship of the Metropolitan Steamship Line running on the outside route between New York and Boston. In 1871 Captain Norton assumed command of the *Crescent City*, operating in the New York-New Orleans passenger and cargo service and in the same year he was appointed harbor master at the Port of New Orleans. Five years later Captain Norton received the appointment as supervising inspector of steam vessels for the Gulf States, a post which he held for eight years. In 1885 he came to New York and started his long and eminently successful journalistic career as editor and publisher of *The Marine Journal*. In that year he became a member of the National Board of Steam Navigation and of the Marine Society of the City of New York. His long life brought to Captain Norton many honors and a host of friends among men prominent in shipping and government circles. He was a member of the Board of Pilot Commissioners and for several years a trustee of Sailors' Snug Harbor.

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

First Quarter Produces Ninety Million Dollar Business

OVER ninety million dollars' worth of marine work, all classes, has been reported in MARINE ENGINEERING AND SHIPPING AGE from January 1 to April 1 of this year, according to statistics compiled from our records. These figures include ship and port work, both contemplated and awarded.

Bearing in mind the general business situation at home and abroad, it is conceded that the first quarter of the year in maritime affairs presents a highly credible showing. The figures given represent only that work which the magazine reported and only those contract awards have been considered for which definite prices were available.

Vessel construction and reconditioning recorded in these columns during the first three months of the year as under contemplation totaled \$12,005,000, while contracts were awarded for similar work in the amount of \$8,100,267. A strong trend in the direction of port improvement is seen in the total of \$61,614,696 reported in the "contemplated" stage in this branch of marine work, with \$8,486,071 in contracts placed. The total for ship work, contemplated and awarded, is \$20,105,276, and that for port developments \$70,100,767, bringing the grand total for all classes up to \$90,206,034.

Optimism is the key word for the marine field at the present time and the only basis upon which constructive progress can continue. It is realized that America's maritime industry must carry on in spite of the non-passage of the Subsidy Bill, and indications are that the second quarter of the year will be even more productive of substantial business than the first quarter. Ship construction and reconditioning contracts which will necessitate the expenditure of many millions of dollars are now pending, a goodly portion of which will have arrived at the "awarded" stage in the near future.

With these facts to consider, there seems to be every reason why every business man having an active interest in the marine industry should put forth renewed effort to see that his company gets its share of the contracts being placed every week.

Specifications Out for Ferryboat for New York Central

PLANS and specifications for the construction of a steel ferryboat for the New York Central Railroad Company have been issued, bids to be opened on May 15. J. W. Millard & Brother, 17 State Street, are the naval architects in charge.

The proposed vessel will have a length over guards of 210 feet, length between perpendiculars 180 feet, extreme beam over guards 66 feet 2½ inches, beam at deck 45 feet, beam on water line 38 feet, depth amidships 17 feet 6 inches.

Propulsion will be by two direct acting, 2-cylinder, compound, jet condensing steam engines, 19 inches by 38 inches by 28-inch stroke. Steam will be supplied by two Scotch return tube boilers, providing pressure at 150 pounds.

Board to Sell 100 Ships

It has been learned that the Shipping Board is preparing to offer 100 vessels for sale as scrap within the next few days, including eighty old German-built ships and twenty built during the war, which for various reasons are considered unsuitable for operation. They are at the present time tied up at ports along the Atlantic, Gulf and Pacific coasts and some in the Philippines.

Federal Shipbuilding Company Submits Low Bid of \$1,496,000 for Eight Ferryboats for New York

THE Federal Shipbuilding Company, of Kearny, N. J., submitted the low tender for the construction of eight ferryboats for the City of New York at the opening of bids by the Department of Plant and Structures, at 2 P. M., on April 26. The prices submitted provided for the ves-

sels propelled by steam engines and by heavy duty oil engines, the boats to be double-ended, for carrying passengers and vehicles, each having a length over guards of 140 feet, beam over guards 52 feet, beam of hull molded 36 feet and draft of 8 feet 6 inches. The figures submitted were as follows:

Federal	1	2	3	4	5	6	7	8
Steam Engines.....	\$211,000	\$199,000	\$195,000	\$190,000	\$190,000	\$187,000	\$187,000	\$187,000
McIntosh & Seymour	272,000	262,000	257,000	253,000	253,000	250,000	250,000	250,000
Worthington	238,000	227,000	224,000	220,000	220,000	216,000	216,000	216,000
Staten Island Shipbuilding Co.								
Steam Engines.....	249,906	244,000	242,000	241,000	240,000	239,500	239,200	239,000
Ingersoll-Rand	274,900	268,900	266,900	255,500	264,900	264,500	264,100	264,000
Worthington	272,000	262,000	260,000	259,000	258,000	257,500	257,200	257,000
McIntosh & Seymour	295,000	289,000	287,000	286,000	285,000	284,500	284,200	284,000
Tebo								
Steam Engines.....	256,000	242,000	241,000	241,000	241,000	241,000	241,000	241,000
McIntosh & Seymour	293,500	291,200	290,000	290,000	290,000	290,000	290,000	290,000
Sullivan								
Steam Engines.....	210,000	420,000	.....	.....	.....	.....	.....	.....

While the majority of the vessels will probably be junked for steel, some may be sold with permission for transfer of registry if the purchasers are willing to spend the necessary amounts to put them into condition for operation. The vessels average about 7,000 deadweight tons.

Name of Sun Shipyard Changed

The Sun Shipbuilding Company has announced a change of name to the Sun Shipbuilding & Dry Dock Company. In addition to its building facilities, the yard at Chester, Pa., operates a large floating dry dock.



The New 27,000-Ton Red Star Liner Belgenland

New Red Star Liner Belgenland Arrives on Her Maiden Voyage

THE new 27,000-ton passenger liner *Belgenland* of the Red Star Line which recently arrived in New York on her maiden voyage from Antwerp contains exceptionally elaborate accommodations as well as every convenience and comfort usually found in first class hotels.

The *Belgenland* is a triple screw steamer having a length of 697 feet and a beam of 78 feet 6 inches. She has a passenger capacity of 2,700, of whom 400 can be accommodated in the first cabin. Her propelling machinery is a combination of reciprocating engines on the wing shafts with a turbine on the center shaft similar to the arrangement which has been found very successful on the *Olympic*. Following the latest passenger ship practice which permits of clear and rapid bunkering she has been fitted to use oil as fuel under her boilers.

PUBLIC ROOMS

The public rooms are arranged practically en suite on the "A" deck. The drawing room is the farthest forward and is decorated in lustreless white. Next is the lounge in which the prevailing color is ultra-marine. Bay windows on each side give an unobstructed view of the promenade deck. Following the lounge is a large smoking room containing a fireplace, card tables

and leather upholstered furniture. Back of the smoking room is a veranda sheltered by green latticed walls.

The *Belgenland* differs from other first

rooms with private baths and 8 with private sitting rooms as well. The intercommunicating system allows various combinations of suites to be made. In the bedrooms are numerous novelties in the way of fittings, such as davenports that become beds, buffets that may be converted into washstands, Pullman upper berths for children, heated towel racks, showers, steam heat regulation by thermostats, electric fans, etc.



Smoking Room

class passenger liners in the number of suites, intercommunicating rooms and private baths. On "B" deck there are 32

Philadelphia Lacks Dry Docking Facilities

ALTHOUGH a total of 3,089,000 tons of ships engaged in foreign trade entered the Port of Philadelphia during 1922 in addition to a considerable tonnage engaged in the intercoastal trade, declared Mr. J. Stuart Crandall in addressing the April meeting of the Delaware branch of the American Society of Marine Designers, Philadelphia has only two commercial dry docks capable of handling ships over 350 feet in length.

From this it will be seen, said Mr. Crandall, that Philadelphia has fewer large dry docks per ton of shipping than any other port. This is also true, he said, in regard to the number of smaller dry docks. This is not a balanced condition and it is practically certain that the addition of at least one and perhaps two dry docks for ships over 350 feet long would more than justify the capital outlay.



Veranda Cafe



Ballroom and Dining Saloon



Sitting Room of Private Suite

Steamship Men Opposed to Government Operation

Personal Opinions of Prominent Shipowners Given at Propeller Club Luncheons

THREE prominent shipping executives, namely, Mr. Charles H. Potter, president of the Maritime Exchange and also of the United States Ship Operators' Association, Mr. Alfred Gilbert Smith, president of the American Steamship Owners' Association, and Mr. R. H. M. Robinson, president of the United American Lines, addressed the April meetings of the Propeller Club in New York on the shipping situation. It is to be noted that they all made it plain at the start that they were giving their own personal views and that they were not to be interpreted as representing any organization.

Mr. Potter after calling attention to the great coastwise fleet of some 125 splendid vessels which has been developed under the protection of our coastwise laws declared that unless something is done for our overseas merchant marine in the near future we would become the laughing stock of the world.

SCRAP INEFFICIENT TONNAGE

It would be for the best interests of the Government, shipbuilders, shipowners and ship operators to scrap all undesirable vessels, declared Mr. Potter. We should not, however, sacrifice the whole merchant marine. It may take two or three years with all pulling together to solve the problem. If however the responsibilities of the operators are gradually increased and some arrangement is made whereby special profits can be put into a fund which at the end of three years could apply in part on the purchase price of new ships that would be a solution which would prevent the vessels from falling into the hands of a few.

Mr. R. H. M. Robinson pointed out that after a year of effort to obtain constructive shipping legislation not only was the subsidy bill defeated but the shipowner had been saddled with additional burdens through the ruling prohibiting the sale of liquor on American ships and through the practical limitation of repairs to American shipyards. He also called attention to the recent reduction in seamen's wages in England while the tendency here was distinctly upward.

Mr. Robinson said that the primary purposes of an American merchant marine were to serve as a naval auxiliary, to avoid isolation when ships of other nations are withdrawn in time of war and to insure that American goods can be delivered directly and regularly without transshipment.

OPPOSED TO GOVERNMENT OPERATION

Government operation of a large fleet, said Mr. Robinson, is not in accordance with the principles of American institutions. He thought the effect of such a policy would be to drive more vessels into the intercoastal trade, to cause a transfer of flag, if that is possible and to send the remainder to the scrap heap.

MAKING SHIPPING A NON-PARTISAN ISSUE

Mr. Alfred Gilbert Smith recommended that a non-partisan body be formed to furnish facts and findings upon which a permanent solution of the merchant marine problem can be developed. He pointed out that a solution can be expedited by all maritime interests working together. As President Cleveland once said, it is a condition and not a theory that confronts us.

Our first step, said Mr. Smith, is to see that the policy adopted is one that the Government will adhere to. Our people have

Shipping Board Offers Fleet for Sale Overlapping Services to Be Eliminated Berths Regrouped Into Eighteen Lines

THE United States Shipping Board has announced that it has issued a call for bids for the purchase of passenger and cargo ships from the board's fleet. All bids must reach the board by May 28, 1923. Bidders are asked to enter into an agreement to maintain line service on one or more of 18 routes named by the board, or such other routes, acceptable to the board, as may be proposed by the bidder.

It was announced that the Board has decided to re-group the regular services now being operated by it, through agents, so that each service shall include a reasonably wide range at each terminus, the purpose being to eliminate overlapping or duplication, while at the same time affording larger markets from which and to which to take cargo. As re-grouped, the proposed eighteen services will be as follows:

No.	From	To
1.	North Atlantic.....	United Kingdom (Great Britain and Ireland)
2.	Gulf and South Atlantic.....	United Kingdom (Great Britain and Ireland)
3.	North Atlantic.....	Continental Europe, North of Bordeaux
4.	Gulf and South Atlantic.....	Continental Europe, North of Bordeaux
5.	North Atlantic.....	Continental Europe, South of Bordeaux including all Mediterranean and Black Sea
6.	Gulf and South Atlantic.....	Continental Europe, South of Bordeaux including all Mediterranean and Black Sea
7.	Atlantic Coast and Gulf.....	East Coast South America
8.	Atlantic Coast and Gulf.....	Orient and Philippines
9.	Atlantic Coast and Gulf.....	India and Dutch East Indies
10.	Atlantic Coast and Gulf.....	Australia
11.	Atlantic Coast and Gulf.....	South and East Africa
12.	Atlantic Coast and Gulf.....	West Africa
13.	Pacific Coast.....	East Coast South America
14.	Pacific Coast.....	West Coast South America
15.	North Pacific.....	Orient and Philippines
16.	South Pacific.....	Orient and Philippines
17.	Pacific Coast.....	Europe
18.	Pacific Coast.....	Australia

The board announces that the bidder may make such offers as he desires; but every bidder shall include in his offer a guarantee to operate the ships to be purchased for a specified period over the routes selected by him, and not elsewhere. The bidder must specify the names of the ships he desires to purchase; the price offered and terms of payment; the route over which he will undertake to maintain service; the charter, frequency, and extent of such service; period of time for which he will

guarantee maintenance of service; and the nature and terms of the guarantee.

So far as possible the bidder shall select vessels now being operated on routes included in the route for which he makes his bid. Bidders are, however, free to specify vessels from the board's laid-up fleet, or even those in operation on other routes.

The bidder may make his bid upon the understanding that the board, upon acceptance of any tender and the making of a contract with adequate guarantee for maintenance of service, will agree not to operate in competition directly or indirectly, government-owned ships, while adequate service is maintained; that it will neither charter nor sell, for operation on that route, at a price lower than current commercial charter rates or world market prices for unrestricted operation.

Prospective bidders are invited to come

to Washington to confer with the Commissioners of the United States Shipping Board who, together with the officials of the United States Shipping Board Emergency Fleet Corporation, will be ready at all times to aid responsible bidders to formulate bona fide bids.

Information is available of the operating costs of the various classes of board vessels, and the financial results of existing services.

The board reserves the right to reject any and all bids.

Cory Extends Service to Boston District

Chas. Cory & Son, Inc., of New York, manufacturer of ships' telegraphs, marine signaling, communicating and lighting equipment has opened an office in Boston at 88 Broad street, in charge of A. E. Sargent, well-known electrical engineer, who for many years was connected with the Bethlehem Shipbuilding Corporation at the Fore River plant.

Combustion Engineering Corporation to Handle Uehling Interests in Canada

The Combustion Engineering Corporation, Ltd., and the Uehling Instrument Company have recently entered into an agreement whereby Uehling interests in the Dominion of Canada and Newfoundland will be handled exclusively by the Combustion Engineering Corporation, Ltd., with principal offices located in Toronto, Montreal, Winnipeg and Vancouver.

Correction

In the description of the electric ferry-boat *Poughkeepsie* published in our March issue the name of the manufacturer of the reduction gears and flexible couplings installed in the vessel was inadvertently omitted. The gears and couplings were the Falk reduction gears and Falk-Bibby flexible couplings manufactured by the Falk Company, Milwaukee, Wis.

Foreign Shipping and Shipbuilding Activities

German Shipbuilding in 1922 Analyzed Oil Burning Installations and Electric Drive Receiving Attention of French Shipowners

By Our Paris Correspondent

VESSELS under construction in German yards in 1922 for both German and foreign account totalled 1,353, of 1,495,700 gross tons, a decrease of 14.9 percent from the 1921 figure, according to the Statistische Reichsamt, forwarded to the Department of Commerce by Consul O. N. Nielsen, Berlin; but tonnage completed during the year was 64.5 percent greater in 1922 than in 1921. The number of ships completed in 1922 was 648.

Of the total under construction for German accounts in 1921, 1,086 vessels, of 1,667,000 tons, were seagoing merchant ships; in 1922 this class of vessel being built for German companies dropped to 407, with a total tonnage of 1,171,600, a decrease in tonnage of 29.6 percent.

The German tendency toward construction of motorships is shown by the fact that in 1920 motorships aggregating 73,000 tons were under construction; in 1921, 135,000 tons; and in 1922, 121,000 tons.

In both 1921 and 1922 there were under construction in foreign yards for German accounts between 40,000 and 50,000 gross registered tons. These consisted of orders placed in the hands of former German companies in Danzig and Memel before the separation of those districts from Germany, and now represent tonnage intended for the reparations account.

In 1920 about 67 percent of the vessels completed came from the North Sea yards; in 1921, 60 percent; and in 1922, 56 percent. The Baltic Sea yards, on the other hand, show increasing business in 1921 and 1922, in the latter year delivering 34 percent, as compared with 33 percent in 1921 and 29 percent in 1920. Inland shipyards built approximately 12,000 tons in 1920, 72,000 tons in 1921, and 31,000 tons in 1922.

Norwegian Course and Speed Recorder Invented

According to the Department of Commerce, a patent has recently been granted in Norway for an apparatus that by the aid of an electric clock connecting the compass, log and clock will automatically register the speed, course and time.

This invention, which is very small and compact, can be installed anywhere on board ship enabling the officers to give incontrovertible proof of the dispositions of the ship.

Italy to Build Big Liners

ROME, Italy (Special).—As a result of the protective policy adopted by the new Mussolini Government, the Italian shipbuilding firm of Tosi Shipyards Company has received a contract for two ocean liners of about 20,000 tons each. These two ships are for the account of the Lloyd Sabaudo of Genoa, which has had many of its former ships, notably the *Conte Rosso* and *Conte Verde*, built in Great Britain. Italy's protective policy for shipbuilding is expected to do a great deal for that industry; in fact, satisfactory results have already been noted.

FRANCE has noted the general movement in the various maritime countries in favor of the adoption of oil-burning under boilers. French shipowners now realize the advantages and economy to be obtained with oil-burning vessels in such matters as a reduced crew, greater bunkering facilities, quicker turn around, less wear on the boilers and other advantages such as general cleanliness of passenger accommodations.

The commercial success of the *Paris*, the largest French vessel afloat, which was placed in service by the Compagnie Generale Transatlantique in June, 1921, has fully confirmed the general opinion in this respect and this company is therefore considering, with more and more favorable attention the conversion of their second largest liner, the *France*, to oil-burning.

CONVERSION OF THE FRANCE

It is already ascertained that such a transformation would result in a reduction in personnel of no less than 160 men. In addition to the saving in wages there must be added the saving in fuel consumption and also the profit of making one more return voyage per annum. Taking into account these various advantages it is estimated that the conversion of the *France* to an oil-burner, which would involve an expenditure of about 6 million francs, would result in a total saving of about 1 million francs per year.

As the *France* is only 11 years old the French Line have very good reason for this conversion and there is little doubt but that

First Large French Cargo-Motorship Nearing Completion

The first big French vessel to be fitted with Diesel propulsion is the cargo-motorship *Camranch* which is being completed by the Chantiers de la Loire at Nantes for the account of the Chargeurs Reunis. This vessel is of 11,700 tons deadweight. Her propelling machinery consists of two Sulzer four-cylinder two-cycle marine engines, each developing 1,700 shaft horsepower, which were built at the Winterthur works of Messrs. Sulzer Brothers. In addition to the main engines, two 410 brake horsepower four-cylinder Sulzer two-cycle engines are provided to drive dynamos at 200 revolutions per minute.

France to Build Six Submarines

PARIS, France (Special).—Six new submarines of 1,000 tons displacement each have been ordered by the French Admiralty. They will be equipped with twin engines of 2,000 horsepower which have been ordered from the Societe Generale Electrique of Nancy. It is reported that six additional submarines have been authorized but, so far as can be ascertained, the contracts have not yet been placed.

a decision will be made to go ahead with this work in the near future.

In case the conversion to oil-burning should be decided upon by the owners, it would doubtless be carried out by the end of 1923 when a general overhaul of the boilers is due in order to comply with the requirements of the Bureau Veritas. It is estimated that the liner would only have to be laid up for about 5 months.

CONTRACT WILL PROBABLY GO TO ENGLISH FIRM

As regards the system of oil burning which would be adopted on the *France*, it is a question whether any of the few French firms who specialize in this equipment would be in a position to offer sufficient guarantees of reliability to secure such a big order and it is hinted that this work might be placed with the Wallend Slipway Engineering Company, who supplied the oil burning installation of the *Paris*. It may be pointed out that this British firm has supplied most of the oil-burning equipment on French vessels.

Up to the present time there are but two firms in France which are in a position to install oil burning installations of their own system under satisfactory conditions: these are the Chantiers de la Gironde, who are now completing the steamship *Aramis* built to the account of the Messageries Maritimes, and the Forges et Chantiers de la Mediterranee, which have just supplied the oil burning equipment for four passenger steamers of the *Mustapha II* type built for the account of the Department of Mercantile Marine (the *Gouverneur-General-Tirman*, *Gouverneur-General-Cambon*, *Gouverneur-General-Lepine* and *Gouverneur-General-Laferriere*). The Forges et Chantiers de la Mediterranee have also carried out the oil burning installation on the two sister ships *Guaraja* and *Ipanema*, built for the account of the Societe Generale des Transports Maritimes à Vapeur, Marseilles.

ELECTRIC DRIVE

These two steamers are the first and so far the only French vessels equipped with turbo-electrical propulsion. These ships have a displacement of 8,000 tons and a deadweight carrying-capacity of 5,130 tons at 23 feet draft. (Length, 360 feet 2 inches; breadth, 46 feet 2 inches; depth, 26 feet 3 inches.) The propelling machinery consists of two turbo-alternators supplied by the Etablissements Sautter-Harlé of 1,000 kilowatts running at 3,000 revolutions per minute. The reduction is 24, the propeller revolutions per minute being 123. Two speeds are provided for, namely, for cargo business, 10 knots, and for passenger business, 13 knots.

FRENCH LINE CONSIDERING ELECTRIC DRIVE

In connection with the future adoption of electric drive by French shipowners it is learned on good authority that the French Line is considering this mode of propulsion for their new passenger steamer *De Grasse*, which is under construction at Birkenhead at the yards of Messrs. Cammell Laird and Company.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPBUILDING AND REPAIRS

Rudder Replaced, Portland, Ore.—The steamer Flavel was drydocked at Portland to have her rudder replaced.

Shipyard Busy, Oakland, Cal.—The Moore Shipyard is fitting out the salmon packers' fleet for the summer season.

Steamer Drydocked, Seattle, Wash.—The damaged steamer Sagadahoc was placed on drydock at Seattle for hull repairs.

Conversion of Tanker, San Pedro, Cal.—The British tanker Lumina is being converted from a coal to an oil burner.

Steamer Drydocked, Portland, Ore.—The Japanese steamer Yoshida Maru has been drydocked for cleaning and painting.

Vessel Overhauling, Oakland, Cal.—The steamer Bessie M. Hanlon has been placed on the Hanlon ways for an overhauling.

Overhauling Steamer, Portland, Ore.—Steamer Hawaiian, of the American-Hawaiian fleet, has been drydocked for an overhauling.

Minor Repairs, Mobile, Ala.—The steamship La-bette was awarded to the Alabama Dry Dock and Shipbuilding Company for minor repairs.

Low Bidder, San Francisco, Cal.—The Crowley Shipyard was low bidder for repairs to the British steamer Berengar, with a tender of \$800.

Vessel Drydocked, Portland, Ore.—The Columbia River Packers' Association cannery vessel has been placed on drydock at Portland for repairs.

Tanker Drydocked, San Francisco, Cal.—The Standard Oil tanker W. S. Miller has been placed on the ways of the Bethlehem Shipbuilding Company.

Vessel Overhauled, San Francisco, Cal.—The tanker Mursa was awarded the Bethlehem Shipbuilding Corporation for overhauling, to enter the oil trade.

Extensive Reconditioning, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation received the contract for overhauling the interior of the yacht Edyth.

Repairs to Steamboat, Baltimore, Md.—The Redman & Vane shipyard was awarded the work of docking and repairing the sidewheel steamboat E. Madison Hall.

Overhauling Steamer, Portland, Ore.—The Shaver Transportation Company's steamer No Wonder has been placed on the docks of the Portland Shipbuilding Company.

Miscellaneous Repairs, Philadelphia, Pa.—The steam pilotboat Philadelphia has been taken to the Philadelphia Ship Repair Company's yards for miscellaneous repairs.

Steamer Fitted, Baltimore, Md.—The Shipping Board awarded the fitting of the steamer Deer Lodge to carry cattle to Lewis Waggner & Company, on a bid of \$6,700.

Diesel Engines Fitted, Oakland, Cal.—The steamer Magunkook, of the Oceanic Steamship Company, was awarded to the Moore Drydock Company for the installation of Diesel engines.

Flush Deck Barges, Nashville, Tenn.—U. S. Engineer Office, Nashville, is in the market for the rental of three flush deck barges, steel or wood, from 200 to 300 tons capacity.

General Repairs, San Francisco, Cal.—The schooner Bangon and the steamer Whitney Olson have been placed on the Bethlehem drydocks for cleaning, painting and general repairs.

Miscellaneous Repairs, Mobile, Ala.—The Light-house tender Sunflower was awarded to the Alabama

Dry Dock and Shipbuilding Company for scraping, painting and other miscellaneous repairs.

Cleaning and Painting, Boston, Mass.—The Nantucket, nautical school ship, has been moved to the Boston Navy Yard for cleaning and painting, prior to departure about May 1 on the annual cruise.

Vessel Repairs, Seattle, Wash.—The steamship Wallingford, recently bought from the Shipping Board by the McCormick Steamship Company, has been shifted to a Seattle drydock for overhauling.

General Repairs, Oakland, Cal.—The Hanlon Drydock and Shipbuilding Company received the contract for general repairs, cleaning and painting of the Hart-Wood Lumber Company's steamer Solano.

Painting, etc., San Francisco, Cal.—The new ferryboat Hayward was taken to the ways of the General Engineering and Drydock Company to be painted, bulwarks removed and to have her engines overhauled.

Vessel Drydocked, Oakland, Cal.—The Hanlon Shipbuilding and Drydock Company was awarded the contract for drydocking, recaulking and other work on the schooner Honoipu, recently purchased by N. H. Hickman.

Vessel Repairs, Sparrows Point, Md.—The Bethlehem Shipbuilding Corporation has been awarded the work of repairing the West Arrow, at a price of \$4,196. The same company was awarded the docking of the West Haven.

Seattle Shipyard Activities.—The following repairs were awarded to Seattle shipyards: Steamship Admiral Evans, for reconditioning; steamship H. F. Alexander, to ship new propellers, and steamship Seapora, for overhauling.

Tailshaft, Etc., Philadelphia, Pa.—The William Cramp & Sons Ship and Engine Building Company has completed a contract which consisted of installing a new tailshaft and propeller on the gunboat Bravo, of the Mexican Navy.

Extensive Reconditioning, West Coast.—The freighter Meriden, recently sold by the General Steamship Corporation to the E. K. Wood Lumber Co., is to undergo extensive reconditioning to fit her for the coastwise lumber trade.

Steamboat Converted, Port Blakely, Wash.—The Johnson Shipyard, Port Blakely, has been converting the steamboats City of Angeles and Puget of the Puget Sound Navigation Company into modern ferryboats. Price \$30,000 each.

Refitting for Service, Oakland, Cal.—The tank motorship Nuuanu, of the Philippine Vegetable Oil Company, was placed on the ways of the Hanlon Drydock and Shipbuilding Company to undergo an overhauling, preparatory to being placed in service again.

Contract Awarded, San Francisco, Cal.—With a bid of \$1,188, the General Engineering and Drydock Company has been awarded the contract for repairs to the California and Oregon Lumber Company's steamer Brookings, formerly the Shipping Board steamer Cowiche.

Contracts Awarded, Seattle, Wash.—The Todd Drydocks were awarded the following contracts: Shipping Board tanker Lubrico, a fishing schooner, a Government-owned brigantine, fisheries steamship, a Puget Sound tugboat, an ocean-going tug, and a lighthouse tender.

Preparation for Service, Sparrows Point, Md.—Previous to being prepared for service, the sidewheel steamer Majestic, bought at Washington by the Annapolis and Claiborne Ferry Company, has been placed in the upper yard of the Bethlehem Shipbuilding Corporation.

Shipyard Activities, Oakland, Cal.—The Moore & Scott shipyard, Oakland, is very busy as a result of having been awarded the following vessels: The ferryboat Cazadero, drydocking; schooner City of Sydney, repairs; two United States submarine chas-

ers, the Vaughn and Cygan, overhauling; and the Lake Cayuga and Lake Francis, conversion to oil and lumber schooners.

Low Bidder for Barge, San Francisco, Cal.—Bethlehem Shipbuilding Corporation, San Francisco, submitted the lowest tender for the construction of a 12,000-barrel towing barge for the Standard Oil Company of California, with a price of \$219,775 and four and one-half months.

Voyage Repairs, Oakland, Cal.—At the opening of bids for voyage repairs to the Pacific Mail liner President Taft the Moore Drydock Company was low bidder with \$7,264. The other bids were: Bethlehem, \$7,840; United Engineering Company, \$8,199, and General Engineering, \$10,865.

Contracts Awarded, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, Mobile, received the following contracts: Steamship Afoundrias, repairs to engine room, pipe lines, boilers, etc.; tug Jim Sid, cleaning and painting; and tug Major Carl A. Lehr, for miscellaneous repairs.

Cardboat Launched, Sparrows Point, Md.—The first of two huge steel cardboats, under construction for the Baltimore and Ohio Railroad, has been launched from the Sparrows Point plant of the Bethlehem Shipbuilding Corporation. The float is 285 feet long, 37 feet 6 inches beam and 10 feet 6 inches draft.

Miscellaneous Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was awarded the following contracts: The Standard Oil tanker Colonel E. L. Drake, general repairs; and the Virginian of the American-Hawaiian intercoastal fleet overhauling of tail shaft and renewal of propeller blades.

Reconditioning Work, Oakland, Cal.—The Hanlon Shipbuilding Company, Oakland, was awarded a large reconditioning job on the lumber carrier Catherine G. Sudden. The Star of Scotland and the Pacific Mail steamer Corinto have also been placed on the ways of the Hanlon for general overhauling.

Scout Cruiser Launched, Philadelphia, Pa.—The 550-foot scout cruiser Trenton, of 90,000 horsepower, has been launched at the shipyard of William Cramp & Sons. She is the second of five scout cruisers being built at the Cramp shipyard for the United States Navy and is expected to make a speed of thirty-three knots.

General Overhaul, Brooklyn, N. Y.—The contract for the drydocking and general overhauling of the steamship Natirar has been awarded to James Shewan & Sons at a price of \$36,810. The proposals submitted were as follows: Shewan, \$36,810; Robins, \$38,850; Crane, \$39,890; Morse, \$42,182; Federal, \$48,185.

Double Launching, Baltimore, Md.—Charles L. Rohde & Sons Company recently held a double launching of a cardboat for the Atlantic Transport Company, 240 feet long, 34 feet wide and 9 feet 6 inches molded depth, and a lighter for the Southern Railway Company, of Norfolk, 125 feet long, 30 feet wide and 8 feet 6 inches deep.

Vessel Overhauling, Portland, Ore.—The late Rear Admiral Peary's famous vessel, the former Arctic explorer Roosevelt, is being overhauled to go in service as a towing vessel. The most modern towing apparatus obtainable is being installed on board the Roosevelt, which is to be utilized in the towing of lumber barges between Puget Sound and California.

Fire Damage, Panama City.—The coastwise steamer Tarpon, operated by the Pensacola, St. Andrews and Gulf Steamship Company, between Pensacola and Mobile and Carabelle was badly damaged by fire on March 23. She was moored at Panama City docks and damage was covered by insurance, it is said. The Tarpon has been in service more than twenty years.

Conversion to Passenger Steamer, Baltimore, Md.—The Baltimore and Carolina Steamship Company

has announced that the Mary Weems, now being used on the freight run of the line, will be put in the Baltimore shipyards shortly for the beginning of work which will make her a passenger ship, to accommodate 200 first class passengers and 50 second class. J. L. Doten, Charleston, S. C., representative.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been awarded the following contracts: Work of retubing condensers, feed water heaters, and rebuilding anchor windlass on the Compagnie Du Boleo's steamer Providencia; reconditioning Associated Oil Company's tug Arabs, price \$21,795; and the O. A. Smith, lumber carrier, for cleaning, painting and overhauling.

Various Contracts, Baltimore, Md.—The Charles L. Rohde & Sons Company received the following contracts: Tugs Wilcox, of Toledo, Ohio, Mary C. McNally and Annie, for overhauling; and barge John J. McNally, for similar work. The German steamer Hensen was floated after replacing a broken propeller blade and having her hull painted. The Vittorio Emanuele III. has been placed on the lower dock of the company.

Contract Awarded, Oakland, Cal.—The Army Transport Service has awarded the contract for reconditioning of the transport Grant to the Moore Drydock Company, as low bidder, the work consisting of painting and fixing first cabin quarters and installation of accommodations for twenty-four passengers in the second class quarters of the vessel. The Grant has been at the Moore ways for cleaning, drydocking and painting, on a former bid.

Repair Job, Brooklyn, N. Y.—The Robins Drydock & Repair Company, of the Todd Shipyards Corporation, Brooklyn, N. Y., was awarded the contract for repairing the American-Hawaiian freighter Texan, which sustained heavy bottom damage as the result of grounding on Block Island. The bids received were as follows: Robins, \$96,790; Morse, \$144,496; Shewan, \$159,000; Bethlehem, \$172,600; Newport News, \$181,300; Sun Shipbuilding, \$199,615.

Diesel Yacht Construction, Seattle, Wash.—The Blanchard Boat Company is constructing, in the plant of the Tregoning Manufacturing Company on Salmon Bay, the full Diesel-powered yacht Samona, which will be the most palatial craft of her type on the Pacific. The yacht, which is building for W. J. Hole, capitalist and sportsman of Arlington, Cal., will be a triple-screw yacht, each screw being driven by a 100-horsepower, six-cylinder Diesel engine, maintaining a speed of 13 knots. The vessel will be 115 feet long and 18 feet beam, heated by electricity and having all latest improvements.

Tank Steamer Repairs, Brooklyn, N. Y.—At the opening of tenders for extensive repairs to the 6,666 gross ton tank steamship Pennsylvania, of the Texas Oil Company, the Robins Drydock & Repair Company, of the Todd Shipyards Corporation, Brooklyn, N. Y., was successful bidder with a price of \$167,000. The Pennsylvania recently went ashore on the Nicaraguan coast and sustained considerable bottom damage, after which she was drydocked at Mobile for survey. The following are the proposals received: Robins, \$167,000; Newport News, \$175,000; Morse, \$176,000; Alabama, \$179,488; Jahncke, \$263,000.

Reconditioning Work, West Coast.—The Moore Drydock Company was low bidder for work of drydocking, cleaning and painting the Pacific Mail steamer Point Bonita, chartered by the E. K. Wood Lumber Company. The tenders were as follows: Moore's, \$1,299; Bethlehem, \$1,525, and Hanlon's, \$1,919. Bids opened for repairs to the United States Army transport Grant were: Moore's, \$6,798; Bethlehem, \$6,996; for cleaning, drydocking and painting. The Moore Company was also low bidder for engine and boiler repairs to the transport Grant, with a price of \$9,878, against the Bethlehem Shipbuilding Company's tender of \$9,954.

Towboat Hull, Jeffersonville, Ind.—The Howard Shipyards & Dry Dock Company, of Jeffersonville, Ind., with a price of \$19,737, was low bidder for the construction of a steel hull for the towboat Elinor, at the opening of tenders by the United States Engineer Office, Rock Island, Ill., on April 12. The boat is to be of the sternwheel type, having a molded length of 125 feet 4 inches, molded breadth 27 feet, constructed with five transverse watertight bulkheads. The bids were: Howard Shipyards & Dry Dock Company, \$19,737; Dubuque Boat & Boiler Works, \$20,000; Dravo Contracting Company, \$25,600; Nashville Bridge Company, \$25,900; Charles Ward Engineering Works, \$27,200.

Contracts Awarded, Mobile, Ala.—The Alabama Dry Dock and Shipbuilding Company has been awarded the following contracts: Shipping Board steamship Hugoton, cleaning, painting, general overhauling of machinery, etc.; Mississippi-Warrior Service Towing steamer Demopolis, repairs to propellers, renewing rudders, machinery job and several other miscellaneous repairs; steamship Shreveport, overhauling machinery, caulking decks, scraping, painting, etc.; steamship Halfway, miscellaneous repairs; steamship Tuxpanoil, repairs; tug Hulver, extensive repairs; steamship Bayou Chico, repairs; schooner Maid of Scotland, cleaning, painting and examination, and oil tanker San Leonardo, of the Eagle Oil Transport Company, Ltd., for examination.

SHIPYARDS AND DRYDOCKS

Dismantling Yard, Baltimore, Md.—The Atlantic Wrecking Company, of which Victor M. Jarrett is president and general manager, will establish modern facilities for dismantling ships at Baltimore on the waterfront of Curtis Bay. About \$60,000 will be expended to clear the site of old grain elevator buildings purchased from the Baltimore & Ohio Railroad, after which the wrecking facilities will be installed, the capacity to be four steamships at one time.

Shipyard, Lower California.—According to Bartley F. Yost, American Consulate at Guaymas, Sonora, Mexico, American interests have asked permission from the Secretary of Communications to install at Santa Rosalia, Lower California, a shipyard for constructing vessels up to 5,000 tons, destined for coastwise and high seas traffic. The company is requesting certain franchises, and states that as soon as the vessels are completed it intends to use them for its own account in open competition with foreign steamship companies.

PORT IMPROVEMENTS

Harbor Improvements, Monterey, Cal.—City plans election to vote on \$200,000 bonds for harbor improvements, dredging, fill, etc.

Piling, Brokaw, Wis.—L. A. De Guere, engineer, Wisconsin Rapids, is taking bids for 800 tons Lackawanna steel piling, for Wausau Paper Company.

Grain Elevator, Oswego, N. Y.—An appropriation of \$1,307,000 has been made for the completion of the grain elevator and terminal on the State Barge Canal at Oswego.

Grain Elevator, Goderich, Ont.—Western Canada Flour Mills, 293 McPherson avenue, Toronto, plans 750,000-bushel addition to grain elevator, reinforced concrete. \$250,000.

Canal, Etc., New London, Wis.—City Council has appropriated \$750,000 to construct canal and drainage system to join Wolf and Embarrass Rivers. C. J. Thompson, clerk.

Dredging, North Carolina.—State Fish Commission, Raleigh, plans to dredge and deepen various inlets to sounds in North Carolina. \$500,000. J. K. Dixon, Trenton, chairman of Commission.

Pier, San Diego, Cal.—The city voted \$495,500 bonds for completion of municipal pier No. 2, including apron wharf, transit shed, paving trackage and equipment. F. A. Rhodes, city engineer.

Harbor Facilities, Troy, N. Y.—Harbor & Dock Commission, Troy, has \$1,250,000 available for harbor facilities. Plans municipal terminal, \$350,000. M. L. Murray, 16 First street, president.

Dredging, Buffalo, N. Y.—The Empire Engineering Company, Inc., North Tonawanda, received the contract for dredging Buffalo Inner Harbor to completed contract depth for maintenance of channel, at a price of \$0.345 per cubic yard.

Levees, Monroe, La.—G. B. Lambert Company awarded the contract for 1,000,000 cubic yards of levee work on Mississippi River, near Monroe, to W. E. Callahan Construction Company, Great Southern Life Building, Dallas, Tex. \$250,000.

Canal to Be Opened, New Orleans, La.—The new Inner Harbor Navigation Canal will be opened formally at the close of the annual convention of the National Foreign Trade Council in New Orleans, May 2 to 4. This canal connects the Mississippi

River with Lake Ponchartrain and transforms great tracts of interior lands into waterfront property suitable for purposes of commerce and industry.

City Wharf, Norwalk, Conn.—Sealed proposals were received by John H. McMahon, chairman, City Hall, Norwalk, Conn., for alternate bids for the construction of about 200 lineal feet of concrete and creosoted lumber wharf with appurtenances, on April 2.

Grain Elevator, Goderich, Ont.—Goderich Grain Elevator & Transit Company is having plans prepared for a reinforced-concrete grain elevator, 1,000,000 bushel capacity, on harbor. Price, \$250,000. J. H. Trommhauser, 69 Adelaide street, East, Toronto, engineer.

Miscellaneous Supplies, Memphis, Tenn.—Sealed proposals were received by the Mississippi River Commission, First and Second Districts, Custom House, Memphis, on April 23, for furnishing and delivering steel bars, wire fencing, machine bolts and insulating paper.

Concrete Wharf, Etc., New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Court Building, on April 5, for concrete wharf, chain walls and column footings for shed at Calborne Avenue Landing.

Canal, Lakeland, Fla.—Lake Parker D. D., canal between Lake Parker and Lake Boney. S. T. Buchannan & Son, Lakeland, received the contract for 50,000 cubic yards of earth and 40,000 cubic yards of rock excavation, 200 cubic yards reinforced-concrete. Price \$0.33½ earth and rock.

Flood Gate, Etc., Blytheville, Ark.—Poinsette Company will soon take bids for flood gate and navigation lock, \$200,000, and also plans complete flood protection and river control system, ultimate cost, \$5,000,000. Pride & Fairley, Blytheville, engineers.

Piling, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Court Building, on April 26, for furnishing 7,500 pieces of green piling in 50 and 75-foot lengths, according to Dock Board specifications. Requisition ED-13352.

Contract Awarded, Houston, Tex.—Anderson Clayton & Company, Mason Building, has awarded the following work to J. B. Townsend, Houston, at a price of \$750,000: warehouses, reinforced-concrete woodpile foundations, cotton compress, 600-foot wharves, concrete construction, also dredging channel.

Bulkhead, Etc., Chicago, Ill.—The Great Lakes Dredge & Dock Company, 104 South Michigan avenue, was awarded the contract by South Park Commissioners, 57th street and Cottage Grove avenue, for bulkhead from 12th to 20th streets, \$1,164,310; 1,000 foot extension to bulkhead at 23rd street, \$95,000.

Contract Awarded, Baltimore, Md.—The contract for the construction of the four million bushel grain elevator to be built for the Baltimore & Ohio Railroad at Locust Point, to replace its two elevators destroyed by fire there last July, has been awarded to M. A. Long Construction Company, of Baltimore. Price, \$3,000,000.

Dredging Contract, Mays Landing, N. J.—The Commerce & Navigation Department, State House, Trenton, awarded the contract for dredging 57,142 square yards of main channel, Absecon Inlet, Mays Landing, to Hill Dredging Company, Atlantic and Somerset streets, Atlantic City. Price, \$0.35 per square yard. Total price, \$19,999.70.

Levees, Yuba City, Cal.—Reclamation District 1660, State Reclamation Board, Forum Building, Sacramento, Cal., awarded the contract for 13-mile levees, varying 12 to 22 feet in height, 2,600,666 cubic yards of clamshell work, and 1,110,000 cubic yards of long boom dredger work, Yuba City, to Callahan Construction Company, City National Bank, Wichita Falls, Tex. Price, \$915,000.

Grain Elevator, Baltimore, Md.—Bids will be received by the Baltimore & Ohio Railroad, Baltimore and Charles streets, Baltimore, for grain loading pier, merchandise pier, storage bins, steel and reinforced concrete, 3,000,000 to 4,000,000 bushel capacity, Locust Point. Price, \$3,500,000. J. S. Metcalfe, 108 South La Salle street, Chicago, architects. L. P. Kimball, Engineering Building, of Baltimore & Ohio Railroad, engineer.

Contract Awarded, Ft. Worth, Tex.—The Western Engineering Company, Dallas County State Bank Building, Dallas, was awarded the contract by Ft.

Worth Elevators Company, N. P. Anderson Building, for one 750,000 bushel elevator and storage tank, 54 by 72 by 192 feet head house with thirty-six 23 by 100 feet storage tanks, all concrete, four 2,500 bushel straight hopper scales, six main elevator legs with 30-inch lift belts, two receiving legs, two shipping legs, one serving leg, and one transfer leg, two large Carter disc separators, one 1,500-bushel hour capacity clipper and scourer, two Richardson auto sacking machines and scales. Price, \$1,000,000.

GOVERNMENT WORK

Scows, Wilmington, Del.—U. S. Engineer, Wilmington, plans to purchase two wooden dump scows.

Repairing Jetty, Galveston, Tex.—U. S. Engineer plans to repair building and extend jetty at Sabine.

Superstructure, Dunkirk, N. Y.—U. S. Engineer plans stone superstructure on breakwater at Dunkirk.

Dredging, Galveston, Tex.—U. S. Engineer plans dredging Houston Ship Channel at Vinces Bayou and Basin.

Dredging, Washington, D. C.—U. S. Engineer, 250 Old Land Office Building, plans dredging in Potomac River.

Gate Tracks, Huntington, W. Va.—Gate tracks at Dam 13, Ohio River, are planned by U. S. Engineer, Huntington.

Barges, Jacksonville, Fla.—U. S. Engineer, Jacksonville, plans to purchase three steel barges for dredge Mallery, Ohio River.

Dredging Pump, Jacksonville, Fla.—Bids were received by U. S. Engineer, Jacksonville, up to April 20, for a dredging pump.

Dredging, Claiborne Harbor, Md.—U. S. Engineer Office, Baltimore, received sealed proposals on April 30, for dredging in Claiborne Harbor, Md.

Dredging Bids Rejected, New York, N. Y.—U. S. Engineer, 616 Army Building, has rejected bids opened on March 2, for dredging in Shrewsbury River, N. J.

Boilers, Florence, Ala.—Bids were received on April 27, at the office of the U. S. Engineer, Florence, for installing steam boilers, etc., on the U. S. Towboat General John Coffee.

Steel Gates, Nashville, Tenn.—Sealed proposals were received by U. S. Engineer Office, Nashville, on April 25, for steel gates for Lock 8, Cumberland River. Further information on application.

Dredging, Wharves, Etc., Pearl Harbor, H. T.—Specifications 4798—Bureau of Yards and Docks, Navy Department, Washington, D. C., plans dredging, wharves and piers at submarine base. Bids opened at local yard.

Fuel Oil, Philadelphia, Pa.—U. S. Engineer, 815 Witherspoon Building, awarded the contract for furnishing 40,000 barrels of fuel oil for vessels in Philadelphia, to Crew Levick Company, 111 North Broad street. \$73,750.

Rock Removal, Etc., New York, N. Y.—U. S. Engineer, Army Building, 39 Whitehall street, awarded Arundel Corporation, 2 Pratt street, Baltimore, Md., the contract for dredging and rock removal in East River. \$704,387.

Painting, Etc., Vessel, Staten Island, N. Y.—Sealed proposals were received by the Superintendent of Lighthouses, Third District, Staten Island, N. Y., on April 2, for docking, cleaning and painting Relief Light Vessel No. 78.

Drydocking, Etc., Staten Island, N. Y.—Sealed proposals were received at the office of Superintendent of Lighthouses, Third District, Staten Island, N. Y., on April 2, for drydocking, cleaning and painting U. S. Lighthouse Barge No. 2.

Cylinder Valves, Etc., Florence, Ala.—U. S. Engineer Office, Florence, received sealed proposals on April 20 for furnishing and delivering six sets of cylinder valves, operating mechanism for the same, etc., for the navigation lock of Wilson Dam.

Superstructure, Detroit, Mich.—Sealed proposals will be received by U. S. Engineer Office, Detroit, Mich., until 11 A. M., Eastern Standard Time, May 3, 1923, for construction of concrete superstructure on west center pier, St. Mary's Falls Canal. Further information on application.

NEW INCORPORATIONS

The Submarine Signal Corporation, capital \$9,000,000, chartered in Delaware.

The Montrose Steamship Corporation of New York, capital \$250,000, chartered under Delaware laws.

The American Export Corporation, of Manhattan, has increased its capitalization from \$25,000 to \$100,000.

The Niagara Ferry & Transportation Company has increased its capitalization from \$25,000 to \$300,000.

William Grixcom Cox, capital \$500,000, incorporated under Delaware laws, to do business as ship brokers.

The Hammond Steamship Company, of Wilmington, Del., capital \$1,000,000, to do business as builders, chartered under Delaware laws.

Ralph Steamship Company, of Brooklyn, capital \$100,000, chartered at Albany. Incorporators: L. N. and J. A. Martin and P. J. Dobson.

The Transit Forwarding Company of Buffalo, capital \$20,000, chartered at Albany. Incorporators: E. B. and A. B. Black and D. L. Sprissler.

U. S. & Levant Steam Navigation Company, capital \$250,000, chartered at Albany. Incorporators: J. J. Binder, S. Brander and R. Frackman.

The Palestine & Oriental Steamship Corporation of Manhattan, capital \$20,000, chartered at Albany. Incorporators: E. Rosen and J. & A. Haber.

Rotary Navigation and Transportation Company of Manhattan, capital \$50,000, chartered at Albany. Incorporators: M. M. Miller and J. W. Bagley.

United States & China Steamship Co., Inc., capital \$12,000,000, to operate between New York and Far East ports. David L. Baumgarten, president.

The Olympus Steamship Corporation, of Manhattan, capital \$10,000, chartered at Albany. Incorporators: W. S. Auld, J. J. Binder and S. Brander.

T. A. Kyle Company, of the Bronx, shipyard, capital \$50,000, incorporated under New York laws. Incorporators: T. A. and J. Kyle, and G. L. Bergen.

The Florence B. Phillips Shipping Corporation of Manhattan, capital \$50,000, incorporated at Albany, to do general lighterage business. Incorporators: J. Potts, E. C. Bould, and G. Palmer.

Russian-American Volunteer Fleet, capital \$10,000, chartered under Delaware laws to operate boats. Incorporators: E. C. Barton of Yonkers, and Martha Kobloff and Ralph F. Kane.

Warner Transport and Trading Company; principal place of business, Miami; capital stock, \$20,000; limit of indebtedness, \$1,000,000. General nature of business, the transportation for hire of passengers and of all kinds of goods between ports in the United States and of the world by means of steam, sailing or other vessels. E. M. Kenworthy, president; E. B. Kurtz, vice-president; W. L. Reed, second vice, and W. T. Schutt, secretary.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson,
U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York.
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City.
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York
President—E. A. Simmons.
Secretary—Robert B. Lea.

The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irving G. Keller.

Port of New York Authority

11 Broadway, New York.
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniawood, 308 Vin St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave. Quincy, Mass

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthroy L. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morrison,
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

June, 1923

No. 6

Published Monthly by

ALDRICH PUBLISHING COMPANY

In Conjunction With

SIMMONS-BOARDMAN PUBLISHING COMPANY

30 Church Street, New York

F. B. WEBSTER, Editor

H. H. BROWN, Managing Editor

S. S. BLODGETT, Associate Editor

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Contributing Editors

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WE GUARANTEE that of this issue, 5,250 copies were printed; that of these copies 4,016 were mailed to regular paid subscribers, 241 were provided for counter and news company sales, 199 were mailed to advertisers, 112 were mailed to employees and correspondents and 682 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 29,550—an average of 4,925 copies a month.

MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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Is Co-operation the Solution?

ACCORDING to Mr. James A. Farrell, president of the United States Steel Corporation, in his address before the recent Foreign Trade Convention at New Orleans, the solution of our shipping problem, and the shipping situation of the world as well, lies in co-operation. He would have the Shipping Board say to American companies: Co-operate with the foreign lines now competing with you; furnish one-half of the tonnage required to move the freight over a particular route; each to act as loading and discharging agent for the other; each to plan which ships of the two companies will operate on an alternate schedule and thus receive an equal portion of the business moving in both directions. In brief, replace unbusinesslike competition with sound co-operative operations; which will substitute profits for losses and will demonstrate to the American investor the advantage of owning shares in American ships, particularly at the low market prices prevailing today. The Shipping Board to sell to the American company the ships required for his share, and to sell to the foreign company such ships as may be required for his share. The price of the ships to be the same to each."

At first reading, one is apt to doubt the possibility of interesting, say, well-established British shipping companies in any such proposition but taking into consideration the

fact that the depression in shipping is world wide, that all maritime countries are confronted with problems similar to our own, due to overbuilding and the high prices paid for tonnage after the war, the advantages of an international regulation of the number of ships in the various trades are certainly worth considering.

No matter how strong financially a foreign shipping line might be, if it were confronted with the proposition of co-operating with a privately operated line or the alternative of competing with a Government-owned line having the Treasury behind it, there certainly would be a great incentive to take the course that would lead to adequate freight rates and a solution of the surplus tonnage problem through the co-operative method. If this is not so, why have pooling and rate conferences been so successful?

We are not in such a poor position to open negotiations for a co-operative plan as a good many people would naturally believe. It is true that our overseas commerce in privately-owned American ships is practically nil but, including our Government-owned ships, it has not so far to go to reach the coveted 50 percent of our foreign trade. This means that we have far more freight vessels than we can possibly use while, on the other hand, foreign maritime countries must sooner or later replace their obsolete vessels with modern ships.

To replace their vessels by new construction, as Mr. Farrell points out, would cost in the neighborhood of \$50 a deadweight ton in England while it would be good business for us to remove the menace that these vessels are to the shipping of the entire world by selling them at \$30 a deadweight ton. If a foreign line is willing to co-operate, let it enjoy the privilege of purchasing such ships from us as it may need on equal terms with American companies.

Now foreign shipping executives may not realize that America is determined to establish an adequate merchant marine of its own, even if it had to do so under the undesirable system of direct Government operation. They may not realize that since the defeat of the subsidy bill the tendency of Congress is distinctly toward discriminatory policies which, whether successful in their object or not, would certainly cause a great deal of damage to foreign lines. But they must realize that if a system of co-operation between American railways and American shipping is put into effect it would have a great influence on the amount of business that foreign lines could obtain.

Such a co-ordination may be forced at any moment, for the Merchant Marine Act of 1920 provides that unless the Shipping Board is convinced that there are not sufficient

American ships to take care of our commerce and so certifies to the Interstate Commerce Commission that the railroads cannot grant export rates to any but American ships.

How much better it would be if an amicable understanding could be reached with our maritime rivals on the basis of a fifty-fifty division of the direct trade. It would promote friendly relations and new business. It would secure stable and adequate rates for shipping without destroying competition in service and it would make work for the shipyards in reconditioning steamers and also in converting a goodly number of vessels to motorships.

A Reflex of the Defeat of the Ship Subsidy Bill

"A MERICAN bid for the world's carrying trade, about which so much was heard a couple of years ago, need not be seriously regarded."

The quotation is from an article in the Shanghai (China) Sunday *Times* of April 1 by its special trade correspondent at London, headed "Great Britain's Lead in New Ship Construction."

While at no time was it likely that the United States would ever take from England "the world's carrying trade," it is true that there *was* a chance to control a considerable part of its own cargoes, both outgoing and incoming. That hope, however, faded with the defeat of the ship subsidy legislation through a plot within the senate equally dastardly, in its way, to the one which nearly succeeded in a vote in favor of Nicaragua instead of Panama as the route for the Isthmian Canal.

In the same article the correspondent says: "I learn from reports received from the Clyde that new orders are exceeding the amount of gross tonnage launched and it is significant that the present is usually the dead season of the year in shipbuilding yards. Similar reports come from the Mersey and Tyneside." This is augmented by figures compiled by the Chamber of Shipping of Great Britain which show that on April 1, 1923, the idle tonnage of British merchant vessels was but 546,000 tons against 1,112,000 tons on July 1 of last year. Incidentally, the April 1 figure is the lowest since December, 1920, when the statistics were first collected.

In the Japan *Advertiser* of May 3 we read under the heading "Eleven Steamship Firms Get Subsidy" the fact that the Imperial Diet has voted three-year mail subsidies to 23 steamers operated by 11 different concerns; while from private sources comes the news that steps are being taken to improve the Pacific ocean steamship service of the Japanese lines between this country and the Orient. This may take some time but the policy is definite. Then, too, the Canadian Pacific Steamships, Ltd., is considering, if indeed it has not already decided upon, the routing of some of its fine *Empress* ships to Japan and China via the United States.

Since Congress will not again convene until December, and since the chances for the enactment then of legislation favorable to the American merchant marine are comparable to the odds in favor of the leopard changing his spots, it is distinctly up to the American shipbuilding and shipping in-

dustry to succeed in spite of the selfish acts of designing politicians.

MARINE ENGINEERING AND SHIPPING AGE has printed much about things which shall be done, if America is to take its proper place among the maritime nations of the world. From now on it will endeavor to so concentrate on its constructive program as to make the needs and ways and means clear at a glance. All of our efforts will be of no avail, however, without the hearty cooperation of all concerned. We refer not alone to the individuals and concerns who have to do with building and operating ships but also to the various organizations in the marine field, such as the Society of Naval Architects and Marine Engineers and American Marine Association.

It *can* be done. America as a nation has never yet failed in any undertaking of moment on which it has concentrated; and there is no reason why the shipping industry of the country should not by the same process remove the obstacles in its path. It *must* be done!

Does echo answer, "It *shall* be done?"

The Farmer's Interest in Shipping

THE farmers ought to be more concerned in the solution of our merchant marine problem than any other class of producers. It is important that the manufacturer who can regulate the creation of his products from day to day should have the facilities of sending his goods to foreign markets directly and promptly without transshipment, but it is far more necessary that the farmer whose potential wealth comes in harvests should be sure that he can place his grain on the market where he wants it and when he wants it there.

As pointed out by Mr. O. E. Bradfute, president of the American Farm Bureau Federation, at the eleventh annual meeting of the Chamber of Commerce of the United States, "the farmer pays the freight both ways. No matter whether that market be in Liverpool, in the case of wheat, or whether it be closer, the farmer pays the freight to the terminal or final market of his product." Taking the case of wheat grown in Kansas, he stated that the price obtainable for that wheat in Kansas in normal times was the price obtainable in Liverpool minus the cost of transportation of the wheat from Kansas to Liverpool. On the other hand, if the farmer buys an automobile the price is determined by the f.o.b. standard at the factory.

It is only natural, therefore, that the farmer should only consider the cost of transportation without considering whether or not the rates charged are sufficient to maintain a service that will always be at his disposal, no matter what conditions prevail in Europe. He quickly forgets the periods when tremendous sums of money were lost because foreign ships were withdrawn from our shores and concerns himself still less, if a foreign ship will take his wheat cheaper, with the reason why it is able to do so.

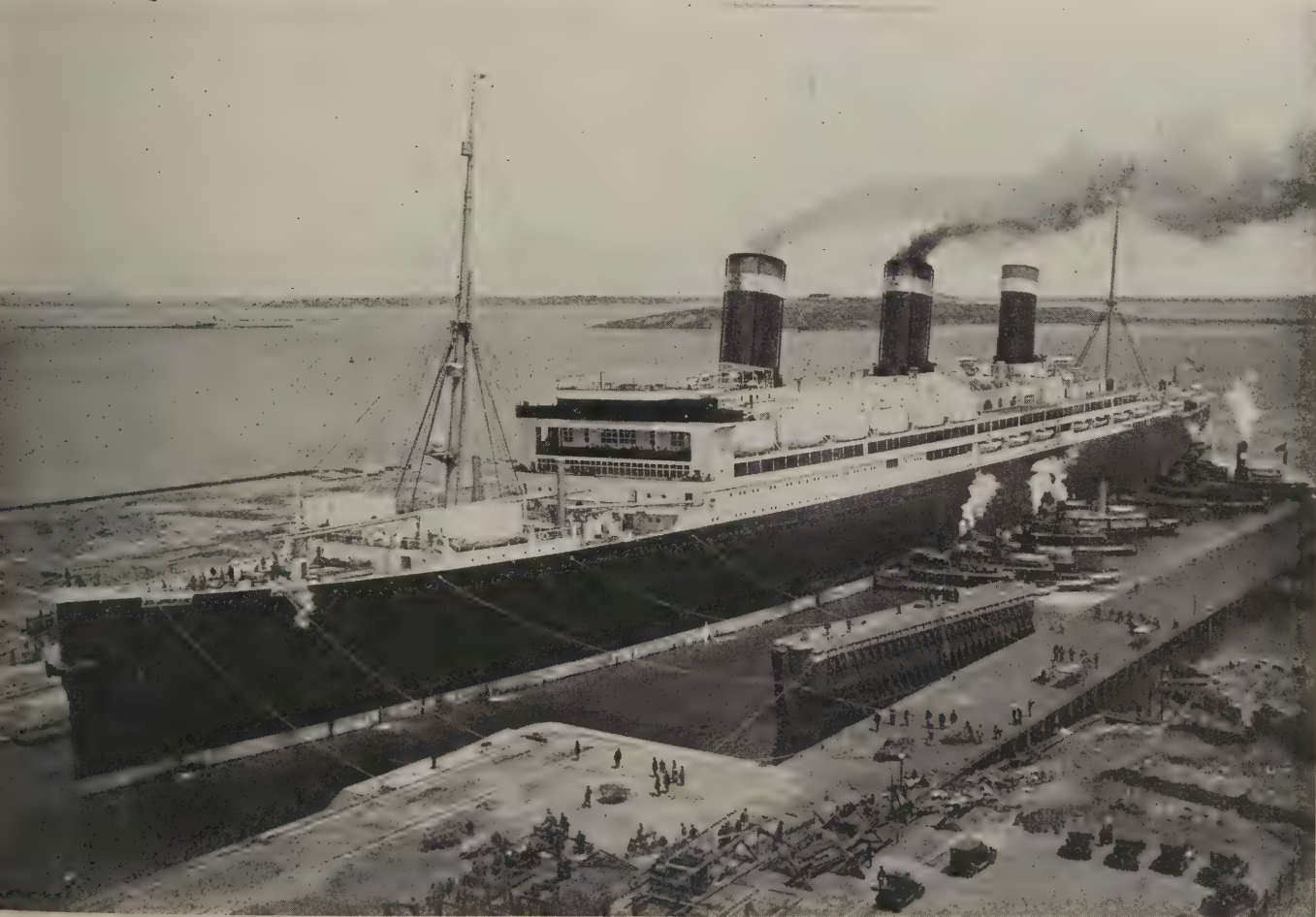
Far be it from our purpose to even suggest that the farmer should saddle the whole burden of the merchant marine. We do, however, want him to take an interest in shipping and to take part in the plans that must be made to formulate a

permanent policy upon which our merchant marine can be developed. If he does this, facts and findings upon which Congress will act can be devised but, if he remains aloof and fails to demand action from his representatives, then he more than any one else will be the principal sufferer, if ocean shipping reverts to the control of foreign lines who will fix the freight rates to suit no one but themselves.

Hull Surveyors' Pay

MARINE underwriters have been indulging in a discussion of the remuneration of their hull surveyors, and it develops that there is an uneasy impression among them that these important representatives are too often underpaid. With the larger insurance offices a staff of salaried surveyors is regularly maintained, but with the lesser lights it is the custom to employ unattached experts on a per diem or single inspection basis. It is the latter who are in a mood to rebel. They insist, and properly, that \$15 is scarcely adequate remuneration for a single inspection, especially when it is remembered that to prepare a man for such work a training of from five to ten years is absolutely necessary. The price is not invariably \$15, of course, but frequently it is no more. On the other hand, it is always much more than

that when the experts are employed by the assured or the repair yards—a field where only the very highest grade of talent is wanted. The underwriters' surveyor argues that his problems are intricate and of the first importance, and that he is brought into contact with the best minds in his line when he matches skill with the men hired by the assured and the repairers, whose interests are frequently directly opposed to those he represents. He complains that for work of the same grade as that for which he receives \$15 or \$25 his rivals are paid from \$50 to \$150; and the oddest thing about it is that these latter bills are in turn passed along to and paid by the same company of insurers that hands him out his lesser dole. When the matter is taken up with the underwriters the objection advanced to higher pay is that expenses must be kept down. A prominent underwriter, in an interview with one of our reporters, admits the propriety of the surveyors' complaint. He agrees that it is more than ever necessary at this time to keep marine insurance expenses down, but he feels that possibilities for saving do not lie in the direction of insufficient salaries for these very useful men. He feels that attention may well be paid to many of the items which enter into claims against underwriters, among them the fees allowed to the surveyors appointed on behalf of the assured but paid by the assurer.



(Photograph by Edwin Levick, N. Y.)

Steamship Leviathan, the Largest Ship in the World, Entering the Commonwealth Dry Dock at South Boston, Mass.

The *Leviathan*, while in Boston, will have her bottom scraped and painted, her propeller shafts drawn and her steward supplies and other furnishings installed. On about June 15 she will start on a five-day trial trip to the neighborhood of Cuba with a party of several hundred distinguished guests on board. On this trip her picked crew and steward's department in particular will be given an opportunity to show their efficiency. On her return she will dock at New York where she will remain until July 4 when she will start on her maiden voyage as a premier passenger liner under the American flag to Cherbourg and Southampton.

E. P. Farley Appointed Chairman of Shipping Board

Definitely Decided to Adopt Direct Government Operation Unless Satisfactory Offers for Shipping Board Vessels Are Received

By Harold F. Lane*

ONCE more the United States Shipping Board is about to enter upon a new régime involving not only important changes in personnel, as the result of resignations, but also a probable change in its methods of operation, as it has been definitely decided to go to direct Government operation of the board's fleet unless satisfactory offers are received for its ships.

Albert D. Lasker, who has presided over the destinies of the Shipping Board as its chairman for the past two years, and who also led the administration's unsuccessful campaign for a ship subsidy bill, has resigned, effective on June 12, and the President on May 10 announced the appointment of Edward P. Farley, of Chicago, as his successor.

Commissioner Chamberlain has tendered his resignation to the President and will retire from the board some time in June and President J. B. Smull of the Emergency Fleet Corporation has announced his intention of leaving by July 1. Commissioner Thompson planned some time ago to quit upon the expiration of his term in June, but it is now expected that he will be reappointed and remain on the board.

Mr. Lasker's resignation, as well as that of Mr. Smull, is in accordance with the understanding had with the President. Mr. Lasker had promised to stay two years, which time expires on June 12. Mr. Smull had originally planned to return to private business on March 4 but then agreed to remain until Mr. Lasker resigned. Mr. Lasker plans to return to his advertising and other business affairs in Chicago. However, because the *Leviathan* was reconditioned under his régime, the Shipping Board unanimously adopted a resolution appointing him special representative in charge of her trial trip in June and also her initial voyage beginning on July 4 from New York to Cherbourg and Southampton.

THE NEW CHAIRMAN

Mr. Farley, the new chairman of the Shipping Board, is not a stranger to its affairs nor to the shipping business. He came to Washington in 1921 as vice-president of the Emergency Fleet Corporation in charge of liquidation and resigned to return to private business last August. Prior to his connection with the Fleet Corporation he had had 12 years of experience as a shipowner and in ship brokerage and marine insurance as president of the Edward P. Farley Company, of Chicago.

*Our Washington correspondent.

Mr. Farley was born in Madison, Wis., and was educated in private and public schools and at the University of Wisconsin. In 1909 he organized the Edward P. Farley Company and he was also later president of the Farley Navigation Company and the Waukua Transit Company, director of the Cornwall Terminal Company and secretary of the Glen Transportation Company. Since his resignation from the Fleet Corporation last August he has devoted his time to the affairs of the Lincoln Mills Paper Company, of which he was chairman of the board of directors. He is also a director of the Inderrieden Canning Company.

The announcement of his appointment from the White House said that the President and Mr. Farley had had numerous conferences, including an extended one on that day, and that he is in full accord with the policy previously announced by the Shipping Board and by the President for the maintenance of the American merchant marine. Chairman Lasker also said that Mr. Farley had played a part in the formulation of the policy of direct Government operation of the ships in case they could not be sold and that he had been in close touch with the board's affairs for several months.

The understanding that Mr. Farley would be the next chairman of the board was reached some time ago. He had been recommended not only by Mr. Lasker, but also by Walter C. Teagle, president of the Standard Oil Company of New Jersey who had been offered the chairmanship before Mr. Lasker was appointed and who has conferred with the President on Shipping

Board affairs on several occasions. Mr. Farley is fully informed as to the difficulties involved in trying to sell the Government's ships as he was in direct charge of the negotiations for ship sales while he was with the Fleet Corporation. In that connection he made a reputation for being a shrewd negotiator.

MO-4 AGREEMENTS TO BE SUPERSEDED

While the exact conditions under which the board will manage the fleet, if it is found necessary to go to direct Government operation, have not been announced, it is understood that the new chairman is fully in accord with the general opinion of the board that the new policy will not involve any arrangement between operators and the board similar to the present MO-4 agreements. The board has tolerated them in the hope that it would be able to sell the ships and

(Continued on page 328)



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E. P. Farley, Who Will Succeed A. D. Lasker as Chairman of the Shipping Board



Ship and Sail on American Vessels by "Old Scotch"

DURING the controversy over shipping legislation last year, a very prominent American in a public speech said that if Americans would patronize their own ships with anything approaching the patriotic fervor given foreign ships by other nations, there would be but little need of Governmental help in this country. Considering that Americans are the greatest travelers in the world, and that more goods arrive and leave our ports annually than are handled by any other one nation, there is little doubt of the truth of his assertion.

Today, Americans can travel to almost all of the leading ports of the world in ships flying our own flag. Furthermore, for comfort, excellency of cuisine, and reasonableness of costs of transportation, it is difficult to excel these American lines. To arrive at the first hand knowledge of these assertions, the writer with his family recently made a trip on the *American Legion* to South American ports. This ship is one of the famous 535's owned by the Shipping Board and operated by the Munson lines on this important route. Other ships of the same type are operated to Europe and to the Orient.

The experience of the writer on this trip was so highly satisfactory and pleasing in every way, that a resumé of the principal features will, it is hoped, be of interest to people in the shipbuilding and marine field generally, and may possibly encourage some of them to make similar trips, and thus enjoy the fruits of their handiwork.

SOUTH AMERICAN TRAFFIC MOST IMPORTANT

The writer firmly believes that this particular line is one of the most important of the various routes operated by the Shipping Board, as it is to the great continent to the south of us that we must look for a large expansion of our

foreign trade. Splendid results in increasing the sale of our goods have already been accomplished, but still greater can and should be developed.

Four steamers are operated to South America, namely the *Pan-American*, *American Legion*, *Southern Cross* and *Western World*. It will be remembered that the construction of these 535's was commenced originally with the idea of safely transporting our troops to and from the great battle fields in Europe. As the armistice intervened before any of them were completed, those which had been advanced in construction were converted into combined freight and passenger ships for commercial purposes. They still possess the predominant features of efficient transports, and, as such, are a splendid asset for purposes of national defense. Their speed of 18 knots and better was fixed to make them safe from submarine attack, and their general construction and bulkheading were designed to exceed the rules laid down by the London Conference on Safety at Sea. Hence there is no question but that they are the safest ships which carry passengers on the high seas at this time.

OUR SHIPS OFFER EVERY INDUCEMENT TO PASSENGER TRADE

These four ships in the South American trade from New York, make it possible to maintain easily fortnightly sailings from each terminus. A round-trip from sailing point to sailing point occupies almost exactly six weeks. The minimum rate to Buenos Aires and return is only \$425. Let it be understood that any minimum rate stateroom on these ships is good enough for the most particular traveler, as these large rooms, each provided with two very comfortable beds, not berths, and with the finest lighting and plumbing are comparable to the best rooms on foreign ships.

With the exception of nine days ashore at Buenos Aires, every cost for the entire six weeks is included in the minimum fare. Where could any one, in these days of high prices, spend a vacation at more reasonable terms? Excellent food, entertainment of all kinds, including "movies" every other night, splendid weather and all the delights of foreign travel are included for the delectation of the traveler, at a total cost of approximately \$75 per week. The "splendid weather" is no romance either, for officers of the line who have spent years on this route will testify that not more than three bad days in one trip are encountered in an entire year. Hence the discomforts of sea travel are almost entirely eliminated.

FAIR WEATHER ROUTE

This trip might well be called the "fair weather route," as it is out of the vicinity of all periodic storms, and traverses that portion of the Atlantic where delightfully cool trade winds are the rule rather than the exception. In the coldest part of our northern winters, and within 36 hours from New York, these ships get into balmy weather, where the sea is never rough and sunshiny days follow one another. In the equatorial regions a few tropical showers lend interest rather than discomfort from what would otherwise be a monotonous series of perfect days at sea.

KING NEPTUNE'S GREETING

Crossing the line is of the greatest interest both prospectively and retrospectively. King Neptune welcomes all Americans who have never before been in his domains. The experience of being initiated into his kingdom is one long to be remembered with most pleasant recollections of the ludicrous incidents of the obeisances paid to His Majesty of the Deep. Each neophyte is furnished with a handsomely engraved certificate of citizenship, after he has gone through the ordeals of naturalization. Hardly has the traveler recovered from the delights of Neptune's visit, the Neptune ball and the Captain's dinner, before he is on the tiptoe of expectation of seeing his first South American port, "Rio in the morning at daylight" is the theme as he turns in on the evening of the twelfth day out from New York. The anticipation of seeing the world's most beautiful harbor is something to cheer up the most blasé and otherwise experienced traveler.

A SCENE OF INDESCRIBABLE BEAUTY

It is not my forte to describe adequately the sensation of getting up just as the sun is rising out of the Atlantic and beholding directly ahead of the ship, the fantastic array of beautiful mountains arising right at the shore line, the white lines of surf pounding at their very bases, and leaping many feet up their granite sides in impotent fury in the age-old battle between sea and land; of the magnificent tropical foliage covering the mountains to their very peaks; of the wonderful panorama of the harbor as you steam slowly through the narrow entrance, guarded on each side by frowning forts; of the beautiful and artistically colored houses and public buildings built on the level portion of the city and up the sides of the mountains; of the navy yard and ships of the Brazilian Navy, the many ships of all nations, and queer looking harbor craft darting in and out at this early hour of the morning. All these must be actually seen, as no amount of description can do justice to this wonderful seaport.

"Rio de Janeiro at last" you say to your neighbor, for heretofore during the passage up the harbor, you are too awe-stricken with the grandeur of the sight to waste time in conversation. The great white ship anchors in the harbor, is surrounded by small craft, the quarantine officer comes alongside, and within an hour you are warped in alongside of a splendid stone quay and begin preparations for going ashore. Your first impression will be the solidity and clean-

liness of the docks and their approaches. No slums surround them as in many of our seaports, and within a minute's ride you are on the leading street of the city, the splendid Avenida del Branco, the Broadway of Rio.

A whirl of sight-seeing around the many places of interest in this delightful city, and at midnight we are off again, viewing the harbor and brilliantly lighted city, under the spell of a moonlit tropical night. Nothing could be more enchanting.

THE SOUTHERN CROSS

To those of us who had never before sailed in the Southern Hemisphere, the gradual sinking of the Polar Star below the horizon, and the eventual disappearance of our old friend the Dipper from the northern skies were of great interest. Their temporary absence from our night gazing was in a manner compensated for by the steady rise of that brilliant constellation, the Southern Cross, famed in prose and poetry.

A comparatively short run of 1,020 miles brings us to the southernmost point of our journey and again at daylight we approach the harbor of Montevideo, the capital of that fine little republic of Uruguay, the traditional friend of Uncle Sam. Soon we are moored alongside a splendid stone quay, and our cargo of automobiles and other manufactured articles consigned to that port is being rapidly unloaded by the very efficient methods in use at these South American ports.

THE RIO DE LA PLATA

The Rio de la Plata which empties into the Atlantic at this port, means literally the River of Silver. It might better be named the Rio de la Mud, from its earthy appearance as it drains a huge area of South America's most fertile soil, and the constant erosion of the soil keeps the water rolled off its mouth for many miles out to sea. It is so broad that the eye cannot reach the other side, even from the channel, which is buoyed for almost the entire distance to Buenos Aires.

Having taken in the many sights of Montevideo, including the several seashore resorts in its vicinity, we leave again at midnight, and retire with our expectations agog with vision of seeing the great metropolis of South America in the morning, as it is only 115 miles away.

At nine in the morning we are abreast of the lower part of Buenos Aires with two tugs at our bow and two at our stern, to insure that we do not go aground in the narrow channel, this being in accordance with Government regulations for vessels of over 10,000 tons. As a matter of fact our keel frequently drags in the mud, because of the shallowness of the water, which must be frequently dredged to keep it navigable. The usual bright weather enables us to get a splendid view of this remarkable city, and its really enormous docking facilities, built in a series of basins along the entire waterfront of the city.

We enter the Darsens Norte where most of the liners dock and are rapidly placed alongside the dock by tugs that are handled most skillfully by expert boatmen. Of the many fine tugs and other craft, it is our first impression that all are of European build, the efficient American tug being conspicuous by its absence. Let our shipbuilders take note of this field for their activities.

All incoming passenger liners land at this same wharf where the Custom House is located, which tends to expedite our entry into the city, although if there was anything in our trunks which was not scrutinized by the vigilant Argentine Customs inspectors, we failed to notice it.

ARGENTINA IS A MECCA FOR SHIPPING

La Belle Argentine, whom all the nations of the world are wooing is a most wonderful country. With its unsurpassed natural resources, its almost entire absence of man-

manufacturing plants, its boundless quantities of foodstuffs for a hungry world, it is indeed a Mecca for the ships of all nations. If you would sell to these people, you must buy of their products, and without your own ships you will do neither. Prior to the establishment of the Shipping Board lines to this great South American nation our trade was negligible, notwithstanding that this should have been one of our principal trading places, both from geographical location and a spirit of friendliness engendered by the common interests of our peoples. Now with our own carriers we can enter into this great market with some chance of success, and woe betide our commercial interests if the present American lines are ever abandoned.

Before we had the Munson Line of Government-owned ships, the motor industry for example was practically controlled by Europeans. Now the tide has changed because



© Kadel & Herbert, N. Y.

Harbor of Rio de Janeiro

of the quick deliveries and low freight rates on American cars. Hence we rode to our hotel in an American taxi, and were much pleased to note that the majority of the motors seen on the streets are of well-known American makes, the omnipresent "flivver" type being in abundance.

WORLD MARKET FOR ARGENTINE'S PRODUCTS

North Americans are welcomed everywhere by the genial, sport-loving and happy people; happy because no Volstead act disturbs their dreams, as they sit at the tables in their sidewalk cafés and partake leisurely of their mild stimulants, of which black coffee forms a substantial part. Why should they worry? The world must have their fat cattle which find so easy a living on their fertile plains, their countless bushels of grain which grows so abundantly, the linseed of which they furnish one-third of the world's supply, the quebracho which tans the hides of which they can furnish unending quantities, and the delicious fruits which their orchards and vineyards produce, while the northern countries are covered with snow.

SHIPS HOLD THE KEY TO THIS GREAT STOREHOUSE

No rail routes can bring these products to the markets of the world, nor bring back manufactured articles to pay for them. Ships are the keys to unlock this great southern storehouse, and ships we must have and maintain, if we are to get from our South American brethren our share of their trade. A visit to the hinterland of this great metropolis is one long to be remembered. Fine railroads (under European management) traverse the country. As mile after mile is covered the eye is delighted with the rolling fertile acres, dotted everywhere as far as the eye can reach with herds of

the sleekest and fattest cattle browsing on the luscious alfalfa of which they have four crops every year without any care or attention. One story stone or brick estancias, fitted up with every comfort for the fortunate cattle owners dot the landscape. There are no barns or unsightly wooden fences visible. Fences many, but of concrete posts and substantial wire construction. Everywhere a well-kept appearance, with no signs of poverty. Oh! happy land, far from Bolshevism and Soviets, "farm blocs" and other evidences of social unrest.

Nine blithesome days are given the traveler in Buenos Aires, amid the attractions of beautiful parks, a wonderful race track, first class hotels and cafés with the best of food and drink, taxi rides so cheap that one cannot afford to walk, a never-ending number of points of interest, until your money is nearly exhausted and then you set sail again for far off New York.

THE SAILING DAY A BIG EVENT

Sailing day of a large liner from this port is of more than passing interest. The nationals of the many countries who reside there gather along the water front to see their home vessel sail away with friends and acquaintances, amid the stirring music of bands afloat and ashore, hundreds of streamers of vari-colored paper ribbons reaching from ship to wharf, the cheering of the crowds, the waving of fond adieus as the ship majestically steams out of the basin into the broad reaches of the river. Slowly the magic city fades from view and thoughts are centered on the long voyage ahead of us.

The next morning we are again at Montevideo, where great quantities of jerked beef and other products of the country are loaded by the busy winches. A peculiarity of trade is that the jerked beef is destined for Cuba, and opportunity is taken to ship it on these fast American vessels, in order that it may not be subjected to a long siege of tropical heat as would be encountered on the slower freight vessels. It is transhipped in New York for Havana, and reaches its destination by this circuitous route in better condition and quicker than it would by other and slower means of transportation.

LOADING COFFEE AT SANTOS

After visiting places in Montevideo which had been overlooked on the first visit, we leave that busy port in the early evening, and soon the ship's bow is headed northward up the coast. On the home voyage all of these American ships stop at the busy port of Santos, the seaport of Sao Paulo, which is located in the hills about 50 miles from the sea. Santos is approached from the rear, by steaming up a narrow river about five miles. It is said that out of this port is shipped two-thirds of the entire supply of coffee in the world.

Here again are splendid stone quays, with the most efficient loading apparatus imaginable. The coffee is loaded from storehouses hundred of yards away from the ship by an endless belt, and comes aboard in sacks so silently that one would not know the ship was being loaded. Bags of this staple breakfast necessity follow in an endless procession at the rate of nearly one per second. Three or four bronzed stevedores seem sufficient to have it properly stowed in the capacious holds of the ship. Some 20,000 bags were loaded in five or six hours after the stream was started.

A MANUFACTURING CENTER

In the meantime many passengers visit the delightful city of Sao Paulo up in the hills, where the air is cool and bracing. This beautiful place seems destined to be the principal city of Brazil. Not only is it the coffee center of the country, but it is rapidly assuming prominence as a manufacturing center, where really excellent shoes are turned out in great quantities. Other passengers who have not taken this ride up in the hills, have found amusement and recrea-

tion in visiting several nearby bathing beaches. All are aboard and ready to sail at 11 o'clock in the evening.

After one of the very few warm nights at sea we are again at the entrance of the world's most beautiful harbor, Rio de Janeiro, and are ashore by noon. More sight-seeing, shopping, visiting friends, dining at some of the fine hotels, visiting the exposition, etc., occupy our time for the 24 hours' sojourn in this Paradise of the South.

At exactly noon on the following day amid similar scenes of farewell as those at Buenos Aires, we leave the hospitable shores of South America for the long homeward bound trip. Every stateroom is filled, showing that American ships are still popular despite their dry reputation. As one Briton expressed it, "Better to have flowing water in the baths, than flowing stimulants at the bar."

SOUTH AMERICANS PATRONIZE OUR SHIPS

Over one-third of the passenger lists are South Americans who mingle with their North American brethren on terms of the greatest amity and friendship. By the third day out incipient outbreaks of English-Spanish and Spanish-English are heard, and it is conceivable that if the voyage had lasted for a couple of months all would have been conversing in both English and Spanish in an understandable manner. Dances every evening, shuffle board, deck quoits and tennis, walking matches, boxing bouts, and horse-racing help to wile away the time, so that each passenger seemed to regret the passage of every day instead of being afflicted with ennui.

THE GAME OF HORSE-RACING

This horse-racing at sea is indeed a novelty and enjoyed by nearly all. Courses of various lengths are laid out on deck, and miniature horses each numbered from 1 to 6 respectively, champ at their bits ready to move a portion of the course, as their numbers are thrown on the dice rolled by volunteers from the passengers. Sometimes the numbers are called out in English and sometimes in Spanish, but all who had bet the munificent sum of 25 cents on their favorite horse could understand "cinco" and "five" or any other numeral up to six. Exciting finishes frequently occurred causing volumes of cheers which must have surprised the flying-fish in the vicinity.

The Dipper once again resumes its place in the firmament, shortly to be followed by the reappearance of Polaris, while the Southern Cross gradually passed from view as the steady 17½ knot pace of the good ship ate up the degrees of latitude on our northwesterly course. Clear skies, indigo waters ruffled by cooling trade winds featured every day, and we were before long approaching the latitude of the Bermudas, which on the tenth day out from Rio, were passed, plainly in view, about 9 miles off.

In the latitude of Hatteras on the following day, we awoke to find the ship rolling violently and running with a screeching southeast gale, which at times assumed a velocity of 50 miles per hour. Any one who doubts the seaworthiness of these 535's should have seen this ship in action. Aside from an occasional swish of spray, the decks fore and aft are dry. It is doubtful if a single soul on the ship was seasick, as all by this time had on their "sealegs," and the blow was a delightful change after the monotony of fine weather.

THE END OF A DELIGHTFUL TRIP

Turning in Sunday night, with the hoarse whistle sounding warnings in a dense fog and rain, we awoke at three the following morning, and found the ship serenely anchored off Quarantine at Staten Island, with a bright moon shining in a cloudless sky. We also awoke to the cold realization that the most delightful trip of our experience had ended, and that we must resume the monotonous existence of wrestling for a living.

The trip up the harbor was a delight to our Argentinian

shipmates, who eagerly searched for the Statue of Liberty, the Woolworth Building, the Battery, Broadway, but of all things those most wonderful skyscrapers of which they had read and dreamed for many months.

By the inquisition of our benevolent Government in the shape of numerous quarantine, immigration and customs officials, and we are once more in the Land of the Free, our first inquiry being "have they settled on a Shipping Policy yet?"

Whatever is done for shipping, we all unite in praying that the South American lines must be kept up and continually expanded.

E. P. Farley Appointed Chairman of Shipping Board

(Continued from page 324)

with the idea of keeping in business operators who might become purchasers, if conditions for operation on their own account were made more favorable by the adoption of the subsidy plan. It has been understood for some time that direct Government operation probably would involve the employment directly by the board of ship crews and officers and the payment of brokerage fees to ship brokerage firms for cargoes obtained for the Government vessels. It has also been the idea that a number of the present managing operators would be used as brokers, as many of them were formerly engaged in that business.

Extension of the coastwise laws to the Philippines will not be seriously considered until the question of whether or not there is to be direct Government operation has been definitely determined, but, if the Government remains in the shipping business, it would expect to be a favored carrier in that service.

BIDS ASKED FOR SHIPS

Bids for the Government's passenger and cargo ships were to be received up to May 28, according to a call issued by the board on April 28. Bidders were requested to enter into an agreement to maintain line service on one or more of 18 routes named by the board, or such other routes, acceptable to the board, as might be proposed by the bidder.

The proposed 18 services which were published in our May issue were suggested for the purpose of eliminating overlapping or duplication and also so that each service would include a reasonably wide range at each terminus, thus affording larger markets from and to which to take cargo. The board, however, will consider any service proposed, if the bidder will guarantee to operate for a specific period over the routes selected by him. Further, the board will agree upon the acceptance of any tender not to operate Government owned ships in competition with him while adequate service is maintained.

RECONDITIONING CONTRACT APPROVED

President Harding on May 8 approved the action of the Shipping Board in awarding the contract for the reconditioning of the *President Buchanan* to the Newport News Shipbuilding and Drydock Company instead of to the Brooklyn navy yard, in spite of protests made by the Brooklyn Chamber of Commerce, the navy yard and the American Federation of Labor. The President acted after requesting a report from the Shipping Board, which showed that the navy yard had not submitted a firm bid but only an estimate and that if the cost exceeded the estimate the board would have to pay the additional cost. It was also pointed out that if the *Leviathan* reconditioning job had been made on the basis of a navy yard estimate the cost would now be about \$1,200,000 higher than it was because the Newport News company had found its costs to be about 15 percent higher than its bid.



Passenger and Freight Steamship Alleghany

New Coastwise Steamships Alleghany and Berkshire

**Passenger and Freight Vessels for the Merchants and Miners
Transportation Company Combine Comforts and Conveniences
of Ocean Liners with Efficient Cargo Handling Arrangements**

ONE concrete illustration of a happy combination of efficiency and economy is to be found in the new steamships recently completed by the Federal Shipbuilding Company, Kearny, N. J., for the Merchants and Miners Transportation Company of Baltimore. One of these vessels, the *Alleghany*, is now in service between Baltimore and Jacksonville, via Savannah, and the other, the *Berkshire*, will trade between Philadelphia and Jacksonville, via Savannah.

As might be expected from a steamship company that has been established since 1854, efficiency has been the prime object in the construction, equipment and appliances of these vessels. The passenger accommodations have been studied from the standpoint of comfort, convenience and cleanliness rather than lavish adornment. All the latest devices for insuring the safety of life at sea have been adopted. The question of quick despatch in loading and discharging cargo has been solved by the installation of labor-saving appliances for handling freight, including bulky automobiles of all types.

PRINCIPAL DIMENSIONS

The principal characteristics of the *Alleghany* and her sister ship, the *Berkshire*, are as follows:

Length overall	368 feet 0 inches
Length between perpendiculars	350 feet 0 inches
Beam, molded	52 feet 0 inches
Depth to main deck	27 feet 3 inches
Depth to hurricane deck	35 feet 0 inches

These steamships have steel hulls, single screws and are what is called the "hurricane deck" type of combination passenger and freight vessels. They have straight stems,

elliptical sterns and are schooner rigged with two steel pole masts. There are four steel and two wood decks with a steel deck house on the hurricane deck and wood deck houses on the promenade and boat decks.

CONSTRUCTED ON THE ISHERWOOD SYSTEM

The hulls are built on the Isherwood system of ship construction with scantlings, workmanship and material in accordance with American Bureau of Shipping class + A 1 E. The stem is a rolled steel bar having a scarp at the lower end; the stern frame is a wrought iron forging constructed in two pieces with suitably located scarps and with the rudder and propeller posts extending into the hull to give good connections to the floors.

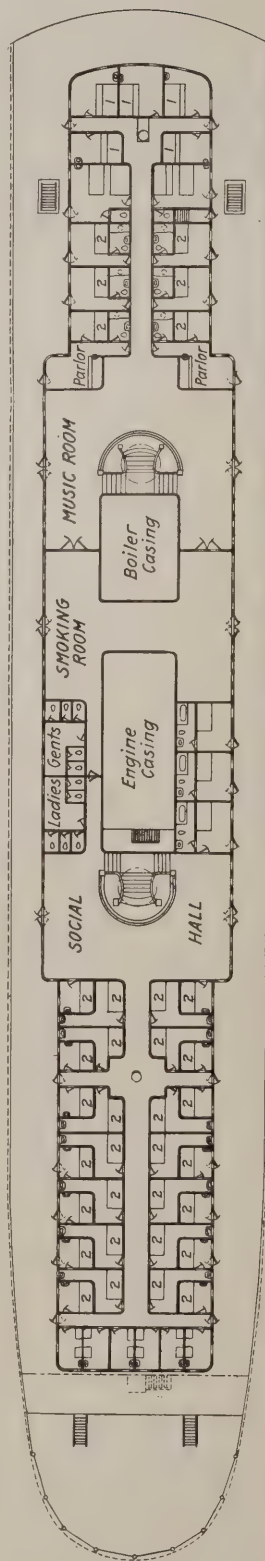
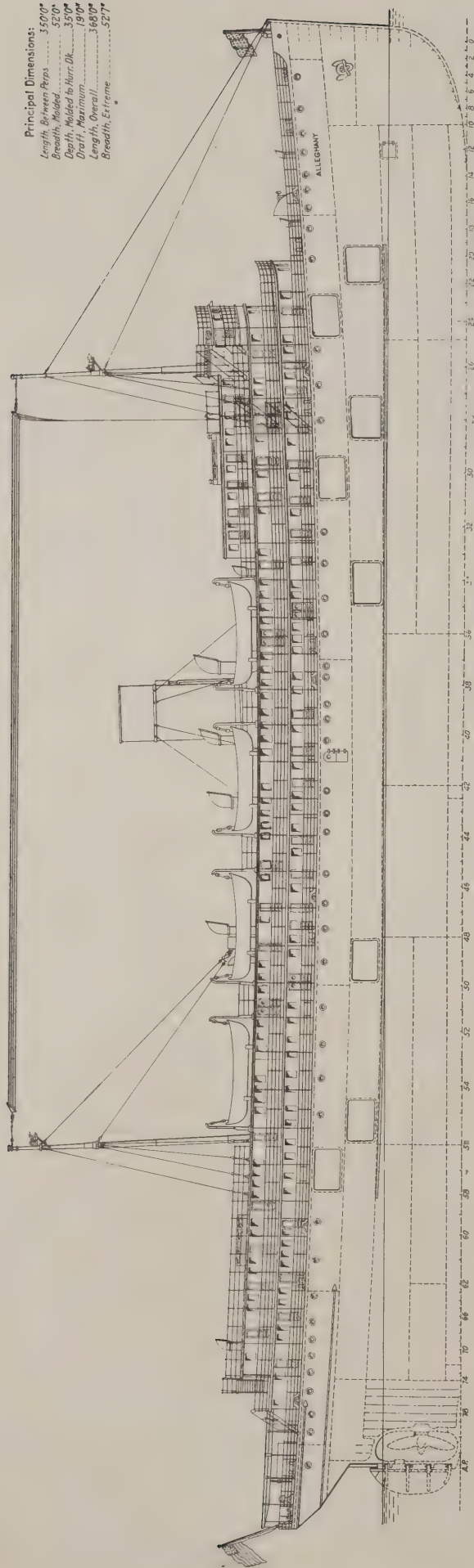
The rudder is of the single plate type, built up, with a wrought iron post and wrought iron arms opposite each pintle. The pintles are of steel having brass casings and working in lignum-vitæ bushings in solid forged gudgeons. The weight of the rudder is supported on a cast iron bearing, lined with white metal and fitted with a brass bearing ring and a cast iron supporting collar made in halves.

STRUCTURAL DETAILS

As may be seen from the drawings accompanying this article, the double bottom extends from the fore peak bulkhead to the after peak bulkhead. The center vertical keel which divides the inner bottom fore and aft is 43 inches deep. One intercostal longitudinal girder is placed on each side of the center vertical keel but in the way of the engine room and in the forward end of the vessel, additional intercostals are fitted.

The framing consists of channels running fore and aft

Principal Dimensions:
 Length, Between Perps..... 350'0"
 Breadth, Moulded..... 52'0"
 Depth, Moulded..... 35'0"
 Draft, Moulded to Hull Dk..... 19'0"
 Length, Overall..... 365'0"
 Breadth, Extreme..... 52'7"

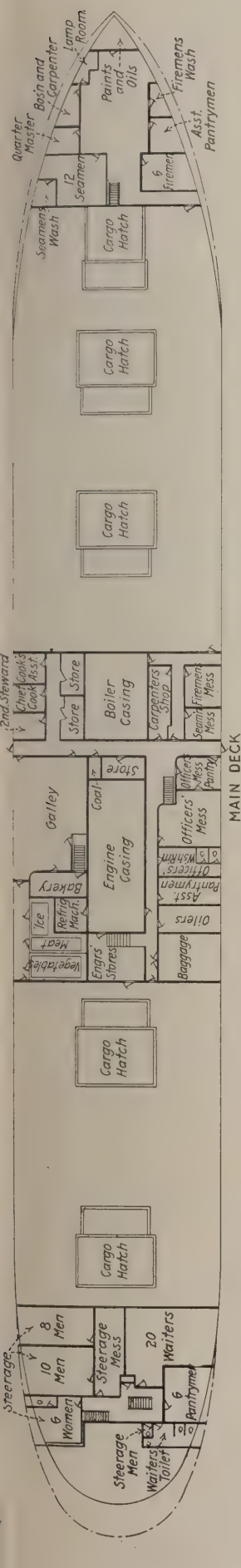


PROMENADE DECK



HURRICANE DECK

General Arrangement Plans of the New Coastwise Steamship Allegiant



Plan of Main Deck of S. S. Alleghany

on the Isherwood system and reinforced by transverse belt frames. The boat and promenade decks are supported by transverse deck beams but the four structural steel decks are framed with bulb angle deck longitudinals supported at widely spaced intervals by transverse beams in accordance with the regular Isherwood design. One row of widely spaced tubular pillars is fitted under the orlop, lower, main and hurricane decks. Special pillaring is constructed under masts, winches, windlass and steering gear.

BULKHEADS

Six bulkheads subdivide the vessel into watertight compartments. Four of these bulkheads extend to the lower deck while the forward and after peak bulkheads extend to the main deck. A watertight door, operated far above the waterline, is fitted in the after engine room bulkhead for access to the shaft alley. A strong steel dust-proof non-watertight bulkhead with a door is fitted between the engine and boiler rooms.

ACCOMMODATIONS

The boat deck, which is constructed of $1\frac{1}{8}$ -inch tongued-and-grooved white pine and covered with canvas is laid on yellow pine carlins and is carried to the vessel's side forming the top of the promenade deck. The pilot house is located on the forward end of this deck on a raised platform which extends to the ship's side, forming the bridge. The top of the pilot house extends 24 inches above the boat deck house providing for an unobstructed view aft through plate glass windows. The forward end of this house is well rounded having closely spaced windows with fixed lower sashes of $3/16$ -inch plate glass in oak frames. The upper sashes are of the sliding balanced type.

The pilot house is heated by a brass pipe coil around the forward end. All hardware and appliances in this room are of brass.

Among the instruments installed in the pilot house are a McNab direction and revolution indicator which shows exactly what the engine is doing, a Lord Kelvin compensating binnacle with a 10-inch card and compass, a double faced repeating telegraph, 12 inches in diameter, a loud-speaking telephone to the engine room, the usual whistle pull and an automatic control for the whistle, tell-tales for masthead, running and stern lights, the operating equipment for a submarine signal apparatus, an alarm board from the pneumatic tube, electrical indicating fire alarm system installed throughout the staterooms, a smoke indicating system which reveals the slightest fire in the cargo holds, the usual barometers, thermometers, clocks, night glasses, megaphones, etc.

Passing to the life-saving apparatus on this deck, there are seven metallic lifeboats, each capable of carrying 42 persons and one motor boat having a capacity for 33 people. Eight Jacob's ladders having a length equal to the distance of the boat deck above the light water line are stowed on this deck.

The officers' quarters are located on the boat deck. They are finished in white and paneled with Vehisote. Each room is fitted with a white pine paneled door and with a brass wire Venetian screen door. The captain and chief engineer are each provided with a double bed and the remaining officers with metal berths of the wall type.

PROMENADE DECK HOUSE

The promenade deck house is constructed of wood and contains in addition to the staterooms, public toilets, etc., a music room, a smoking room and a social hall. The sills, posts and stanchions are of yellow pine. The outside is paneled with $1\frac{1}{8}$ -inch white pine and inside with 1-inch white pine sheathed with Vehisote. All weather doors are of white pine with oak Venetian brass wire screen doors inside.

The music room has double entrance doors, including screen doors fitted on each side, furnished in cane mahogany with tapestry upholstery. An artistic circular skylight located over the main stairway is finished in harmony with the interior work.

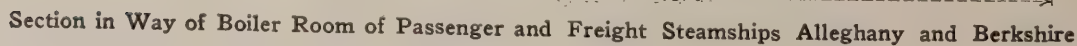
This room is carpeted and furnished with a piano, comfortable chairs, sofas and tables.

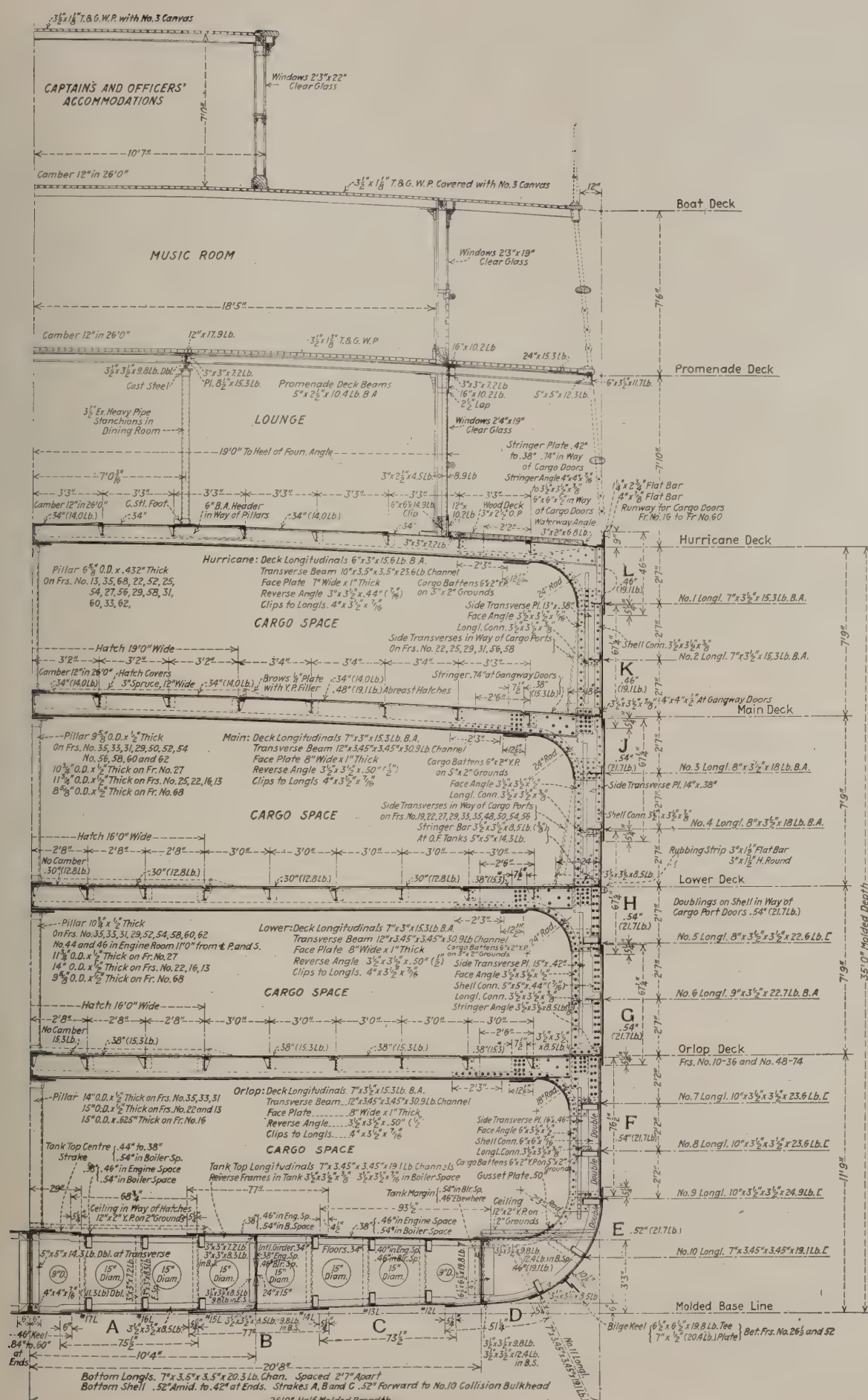
Aft of the music room is the smoking room. This is a very pretty room finished in cherry strained mahogany with a paneled ceiling. The floor is laid with rubber tiling fitted in large squares. Double entrance doors open on each side to the promenade deck and access is also provided to the quarters fore and aft. This room is furnished in mahogany with leather upholstery.

On the after end of the promenade deck is a social hall with a circular skylight finished to suit the interior. A striking feature in all the public rooms on this deck is the drinking fountains fitted with spring cocks which supply cold running drinking water. The social hall is furnished with reed furniture with tapestry upholstery.

The hurricane deck house is constructed of steel and contains, in addition to the staterooms, the dining saloon, pantry and a lounge furnished in mahogany with tapestry upholstery. The dining saloon has a seating capacity for 107 persons at tables arranged to seat 2, 4, 5 and 6 people. Mahogany tables with hinged storm guards and mahogany chairs, upholstered in hair and leather, together with two large mahogany buffets having large beveled edge mirrors give this public room a cheerful and rich appearance. The floor is laid with Lit-o-Sil-o and covered with Beaver Tile.

At the forward end of this deck is the lounge ex-





Midship Section of Passenger and Freight Steamships Alleghany and Berkshire

General Data: Steamships Alleghany and Berkshire

General Information

Service: Coastwise.
Builder: Federal Shipbuilding Company, Kearny,
N. J.
Owner: Merchants' & Miners' Trans. Co., Balti-
more, Md.

Characteristics

Length, overall 368' 0"
Length, B. P. 350' 0"
Breadth, molded 52' 0"
Depth, molded to hurricane deck 35' 0"
Draft, loaded 19' 0"
Draft light, mean 11' 0"
Block coefficient 0.70
Speed, loaded, knots 12
Cruising radius, nautical miles 4,600
Framing Longitudinal
Class + A. I. E. American Bureau of Shipping

Tonnages

(In tons of 2,240 pounds)

*Weight of hull 3,000
**Weight of propelling machinery 650
Deadweight capacity 3,300
Displacement 6,950

(In tons of 100 cubic feet)

Gross register 5,486
Net register 3,261
*Weight of hull includes hull proper, hull fittings,
equipment, and outfit.
**Weight of propelling machinery includes en-
gines, boilers (wet), shafting, propellers, and ma-
chinery space auxiliaries.

Equipment

Anchor Bower Stockless 6,580 lbs.
Anchor Bower Stockless 6,580 lbs.
Anchor Bower Stockless 5,600 lbs.
Anchor Stream Stockless 2,415 lbs.
Chain 270 Fath., 2½" Stud Link

Rudder

Area 99 sq. ft.
Dia. stock 9"
C. press. abaft C. L. pintles 3' 1"

Complement

Deck officers 6
Deck crew 10
Engineer officers 4
Engineer crew 9
Purser's and steward's department 41
Total officers and crew 70
First-class passengers 205
Second-class passengers 24
Total passengers 229
Total complement 299

Handling Equipment

No.	Type	Capacity	Length
Masts 2	Steel	Wireless	
Derrick posts ... 10	Steel	2½ ton 'tween dk.	

Deck Machinery

(Number, Size, Type)

Steering Gear Hyde, Drum Type, 9"x9"
Windlass Hyde, Spur Gear, 9"x10"
Capstans 2—8"x8" Hyde
Winches 10 Lidgerwood Twin Cylinders, 8¼"x8"

Life Saving Equipment

Lifeboats	No.	Type	Length
40 persons 7		Steel	
33 persons 1		Steel Motor	

Propelling Machinery

Boilers

Number 4
Type Scotch, Single Ended
Length 11'-2½"
Diameter 14'-3"
Furnaces 3 Furnaces, each boiler 42" dia.
Fuel Oil, White
Draft Howden forced
Total heating surface, square feet 9,216
Total grate surface or furnace volume 231 sq. ft.
Working pressure, lbs. per sq. in. 200
Normal fuel consumption:

Per day, tons 36
Per horsepower hour, pounds 1.25

Engines

Number One
Type Reciprocating, 4 cylinder
Size 24½ x 41½ x 54 x 54—48 triple
Horsepower 2,700 I. H. P.

Propellers

Number One
Type 4 bladed, built up
Diameter 16' 6"
Pitch 17' 6"
R. P. M. 81.1
Projected area 85.5 sq. ft.
Developed area 97.1 sq. ft.

Auxiliary Machinery

(Number, Size, Type)

Machinery Space
Condensers, 2 main and auxiliary.
4,000 sq. ft. surface.
800 sq. ft. surface.
Evaporators, one 20-ton Reilly.
Distiller, none.
Filters, one.
Feed water heater, one No. 18 type D Reilly.
Fuel oil heaters, two White Type B.
Pumps:
One 12 x 26 x 18 vertical twin air.
Two 14 x 9 x 24 vertical feed.
One 9 x 6 x 12 vertical aux. feed.
One 12 x 8½ x 12 vertical duplex ballast.
One 12 x 8½ x 12 vertical duplex fire.
Two 7½ x 6 x 10 horz. duplex sanitary.
Two 6 x 6 x 6 vertical duplex oil and bilge.

Two 5¼ x 5 x 5 vertical duplex F. W. pumps.
Two 5¼ x 4 x 8 vertical duplex fuel service.
One 4½ x 3¾ x 4 horz. duplex hot water.
Two 3 x 2½ x 3 horz. duplex ice water.
One 4½ x 4 x 4 vertical duplex evp. feed.
Two 7½ x 5 x 6 horz. duplex D. K. service.
One 10 x 12 x 12 horz. aux. air and circ.

Refrigerating Machinery

One 2 ton Brunswick double condenser capacity

Electric Equipment

Generators, two 50 K.W., one 15 K.W. Gen-
eral Electric.
Radio, one 2 K.W.
Emergency, batteries.

Holds

No.	Length	Hatches
1 52-0		13-0 x 19-0
2 71-6		13-0 x 19-0
3 50-9		13-0 x 19-0
4 57-7		12-0 x 19-0

Capacities
Cargo Space

Compartment

No. 1 hold 11,930	
No. 2 hold 25,000	
No. 3 hold 13,330	
No. 4 hold 5,300	
No. 1 orlop 'tween deck 13,740	
No. 2 orlop 'tween deck 25,000	
No. 3 orlop 'tween deck 18,460	
No. 4 orlop 'tween deck 18,460	
Upper 'tween deck 113,170	
Forward main 'tween deck 35,500	
Aft main 'tween deck 28,460	
Total bale capacity 307,319 cub. ft.	

Refrigerated Space

Compartment	Cu. Ft.
Ice 27	
Meats 32	
Vegetables 50	

Bunkers

Compartment	Ton.
Port settling 12	
Starboard settling 13	
Inner bottom No. 3 12	
Inner bottom No. 2 20	
	57

Tanks

Compartment	Cu. Ft.	F. W.	S. W.
Fore peak 92			
No. 1 inner bot. 62			
No. 4 inner bot. 115			
No. 5 inner bot. 12			
No. 6 inner bot. 4			
Aft peak 56			

tending the full width of the house. A large hardwood stair-
way, fan-shaped at the bottom leads to the music room above.

STATEROOMS

Four staterooms at the forward end of the hurricane deck
house and six at the forward end of the promenade deck
house are fitted with double metal bedsteads and with a
single metal berth above. There are also 41 two-berth and 8
one-berth staterooms in the hurricane deck house and 40 two-
berth and 6 one-berth staterooms in the promenade deck
house.

Every stateroom is furnished with a washstand fitted with
running hot and cold water. Nothing has been overlooked to
make these rooms exceptionally comfortable in every respect,
even to providing berth lights similar to those used in Pull-
man sleeping cars so that one can read easily in bed.

PLUMBING

On the promenade deck there are three bathrooms fitted
with porcelain tubs and six shower rooms connecting to
staterooms and on the hurricane deck 10 shower rooms con-
necting to staterooms. Running fresh and sea water is sup-
plied to all baths and the showers are provided with a spe-
cial thermostat valve which prevents any possibility of any-

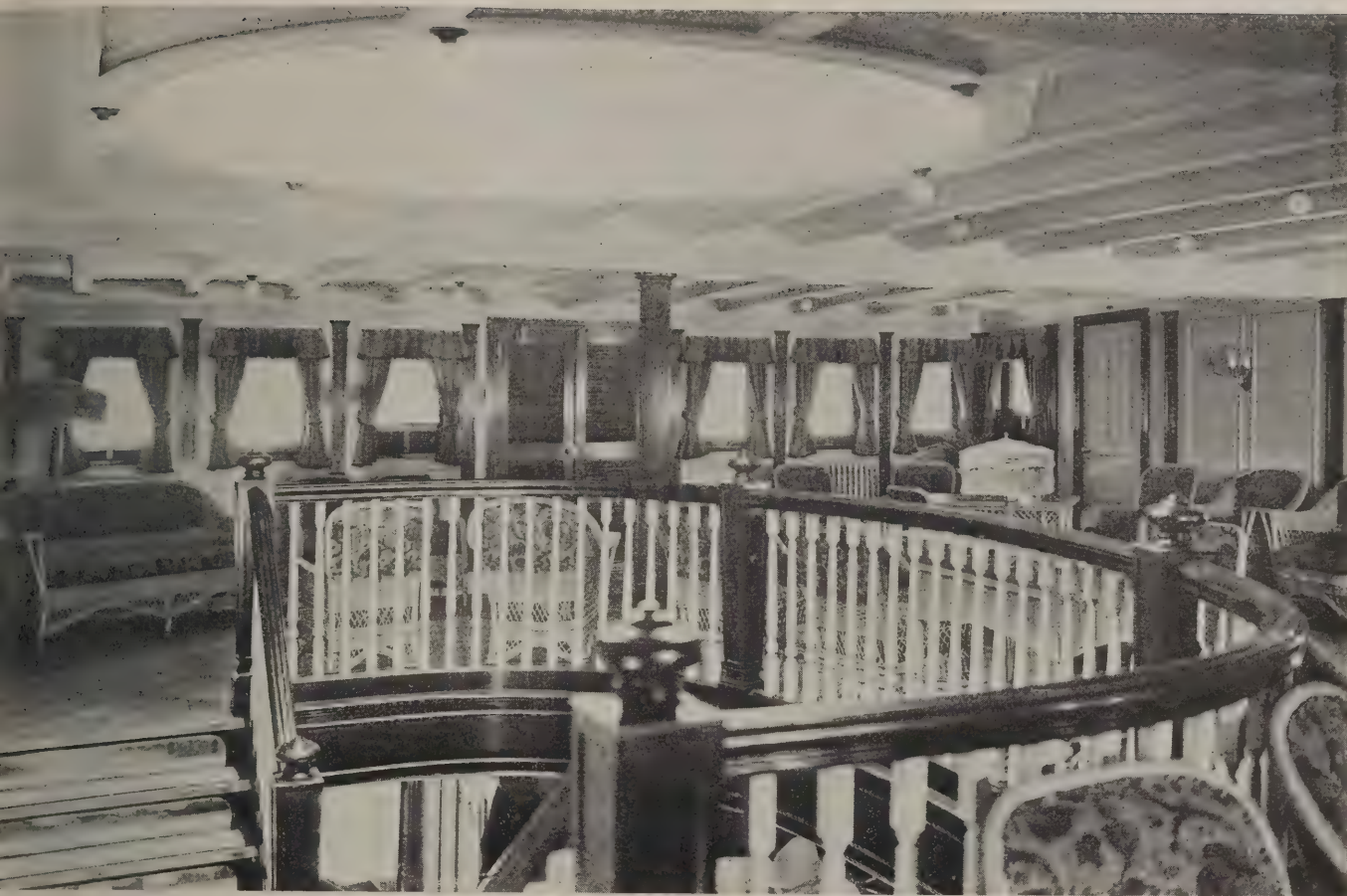
one accidentally scalding himself. Mosaic tile is laid on the
floor over sheet lead and in the way of showers up the sides.
Elsewhere the walls are covered with Vehisote tiling treated
with waterproof enamel.

SALOON PANTRY

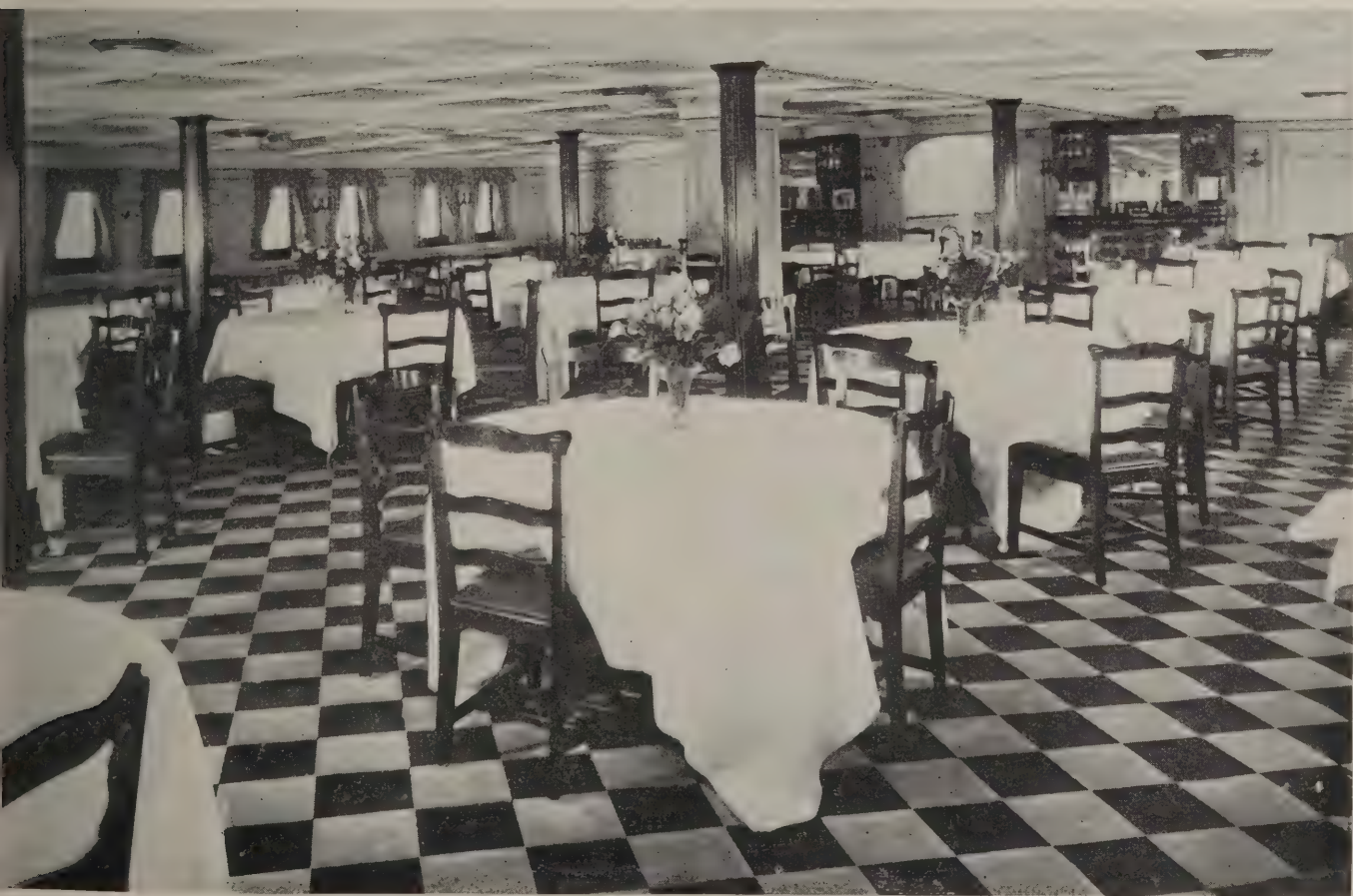
The pantry is located just forward of the dining saloon
on the port side. Access is provided by double doors direct
from the saloon. The floor is laid with mosaic tiling and the
walls are covered with Vehisote tiling. Included in the
equipment are the following: A seamless cast iron Vortex
dishwashing machine, a battery of 5-gallon heavy nickel-
plated copper coffee urns, a combination urn stand, cup
warmer and drainer, a three-bucket egg turner and cooker,
a nickel silver top steam table, 9 feet 6 inches by 30 inches,
an automatic bread toaster and an 18-inch by 36-inch elec-
tric griddle.

GALLEY

The galley is located on the main deck almost directly
below the pantry. The floor is laid with brick efficiently
drained and the ceiling insulated with mineral wool and
galvanized sheet steel. The equipment here consists of a
steel plate galley range containing three fires and four ovens,



Social Hall



Dining Room



Lounge



Smoking Room

an upright vegetable steamer, a 25-gallon aluminum double jacketed steam stock and soup kettle, a 16-inch vegetable peeler with carborundum-lined body and revolving disk, a steam press or warmer and a coke bake oven having a capacity of 60 one-pound loaves of bread.

An exhaust system of ventilation is provided for the state-rooms, public spaces, pantry, galley and public toilets. Telephones are installed in each room.

CARGO PORTS

For quick and efficient loading and discharge of freight the ship is provided with 3 watertight cargo ports on each side of the main deck. These ports are 10 feet by 6 feet 7 inches in the clear. On the lower deck there are five watertight cargo ports ranging from 9 feet by 8 feet to 10 feet by 7 feet in the clear. These ports when opened are suspended by chains from trolleys running on a flat bar rail at the gunwale. One lumber port about 4 feet by 3 feet 6 inches is also fitted on each side of the vessel just aft of the forward peak bulkhead.

It may be said at this point that the principal revenue of this line comes from the carriage of freight and that every effort has been made to expedite its handling. The character of the freight is such that it cannot be safely stowed for great depths without damaging the underneath portions, so our complete steel decks have been fitted. The five hatches are served by jib cranes and winches, two being located at each hatch.

PROPELLING MACHINERY

The main propelling machinery consists of four single ended, return-tube Scotch boilers fitted with the Todd oil burning system and Howden forced draft and one 4-cylinder direct acting triple expansion engine of the Hooven-Owens-



Music Room

entschler type. The propeller is of the built-up class having four right handed blades.

Complete information relating to the auxiliary machinery is tabulated on the data sheet accompanying this article, but there are several points on which comment can be made. The pumps which were supplied by the Warren Steam Pump Company, with the exception of the fuel oil feed pumps, have their pump cylinders of Government bronze. The fuel oil pump cylinders are of iron. All the vertical pumps have piston rods of the divided type; that is, the steam end of the piston rod is of Tobin bronze. These rods are joined by heavy crossheads and caps of forged steel. The main air pump has two steam and two air cylinders and the cylinder connections are so arranged that in case either steam

cylinder becomes disabled it can be cut off and the pump run on the opposite cylinder.

ECONOMICAL SPEED

Referring to the horsepower of the engine and the speed of the ship, it has been ascertained that here again the principles of economy and efficiency have been coordinated to



Corner of Social Hall

the fullest extent. A higher speed could not have been obtained except at a sacrifice of cargo-carrying capacity through finer lines and increased weight and cost of machinery. As desirable as high speed may be in the usual passenger trades, in this case there is no advantage as the speed was determined so that the vessel would arrive at her terminal ports early in the morning, thus giving the stevedores a full day to load and discharge. As can easily be seen there would be no advantage in arriving at a port before daylight and it would be impossible to increase the speed sufficient to cut off 24 hours in her sailing time, which condition would be required in order to obtain the full day for the stevedores.

All in all these ships represent the latest and most modern type of vessels in the Atlantic coastwise trade, having comforts and conveniences for the passengers that are only found in the larger types of ocean liners. They are a splendid example of the kind of workmanship that can be turned out in an American shipyard and it is to be hoped that other steamship owners will give serious consideration to replacing such vessels as have become antique and which foreign ships would drive out of business if it were not for the coastwise laws. Owners may well consider the fact that when the *Alleghany* and *Berkshire* were contracted for the price of steel was only \$1.40 a hundred pounds. It is now \$2.50 with the prospect that not only steel but other materials and labor will be dearer in the future.

No Recovery for Injuries Unless Vessel Is Unseaworthy

WHERE an oil tank steamship is new and modern in design, with all necessary improvements to enable her to perform the service in which she was employed and there was no failure to supply proper appliances nor to keep them in order, there can be no recovery for maintenance, cure and wages and this has not been changed by the Seamen's Act, March 4, 1915, Sec. 20, declaring seamen having command not fellow servants with those under their authority, says the Court in the *Swiftsure*, 286 Federal Reporter, 689.

Mammoth Car Ferry Launched on Ohio River

Steamer Will Handle Complete Trains Consisting of Mogul Engine and Eleven Steel Pullmans at a Single Crossing

THE recent launching of the huge railroad car transfer steamer *George H. Walker* in the Ohio River attracted a large crowd of spectators, as the event marked history in marine construction for the inland rivers and waterways. This steamer is the largest and most modern boat that has ever been built and launched for the inland rivers and it will be placed in railroad car transfer service across the Mississippi River between Mexico and the Southwest, and New Orleans and the East. The river crossing is made between Anchorage, La., and Baton Rouge, La. Complete trains consisting of a powerful Mogul engine and 11 85-foot steel Pullman cars; or 25 loaded freight cars will be handled by the boat at a single crossing.

The steamer has a molded length of 340 feet; a beam over the guards of 91 feet 6 inches; a molded beam of 56 feet and a molded depth of 11 feet. It is of all steel construction throughout, carrying three tracks with switches arranged so that the cars can be shifted from any one track to the other two. The parallel midships body is about 244 feet long. The entrance is 48 feet long and of the modified scow-bow type, so as to improve the navigating characteristics and to sweep aside driftwood. The boat has a long sloping stern 48 feet in length.

HULL CONSTRUCTION

The hull is divided into 26 watertight and two oiltight compartments by means of 13 transverse bulkheads and a centerline bulkhead. In addition to the longitudinal bulkhead on the centerline, there is one non-watertight longitudinal wing bulkhead on each side in way of the side tracks. These wing bulkheads are intercostal between the transverse bulkheads. The three fore and aft bulkheads and the sides of the boat, forming five longitudinal girders, provide ample strength and rigidity under all conditions of loading. The scantlings are such as to withstand the weights superimposed and to absorb shocks and impacts resulting from the heavy locomotives passing from the land cradles on to the floating structure.

The shell plating is 7/16 inch throughout; deck plating 3/8 inch and 7/16 inch and all bulkheads are made up of 3/8 inch plating. The transverse bulkheads are closely spaced and with one longitudinal bulkhead in way of each track, the weights of the cars and the stresses resulting therefrom are well distributed over the entire structure. The racking and torsional strains are taken care of by trusses placed athwartship between the transverse bulkheads.

The guards are supported at every fourth frame by substantial outriggers of the truss construction type, and a deep web plate is fitted at every transverse bulkhead. In way of the machinery space, the outriggers are placed on alternate frames. Additional support is provided in the way of the paddle-wheels and boilers by means of stiffeners and hog rods from one side of the boat to the other.

The deck house is a comparatively light structure consisting of 1/4 inch plating at the bottom with 3/16 inch plating at the top and 3/16 inch flooring. Stiffeners are placed on alternate frames, with deck beams at every frame.

The three tracks are spanned from starboard to port side deck house by a bridge 27 feet long, supported by two heavy trusses and by double channel columns rising from the hull. The pilot house is built of wood and its dimensions are 16 feet by 18 feet.

The boiler plant is made up of two batteries of boilers, each consisting of two boilers 6 feet in diameter and 18 feet

long; one battery on the starboard and one on the port side of the boat. The boilers are of the modified Bonson type and will be adapted to the burning of fuel oil but will also permit of the possible use of coal. Oil burners are of the Lientz type, using steam for atomization.

These boilers are designed for 200 pounds pressure and have a total heating surface of 7,520 square feet. One battery of boilers is of sufficient capacity to furnish steam for both engines, so that the boilers on the other side of the boat can be shut down for repair or cleaning without suspending the operation of the boat. The flues are 3 1/2 inches in size and water pipes connecting the headers are 4 inches, outside diameter.

Induced draft is provided for by steam exhausting into the smoke stacks, but generally the boilers will be operated under natural draft and the steam exhaust will be used for heating the feed water. The steam lines and the feed water lines are interconnected so that the main engine and auxiliaries on one side can draw steam from the boilers on the opposite side and the boilers can be served by the auxiliaries on either side. The boilers are lagged with 2 1/2-inch "Sil-O-Cel" and the flame bed is built of fire brick and "Sil-O-Cel" and covered on the outside with sheet metal.

PROPELLING MACHINERY

The steamer is propelled by independently operated side wheels, 31 feet in diameter and 14 feet in length, having 18 buckets 36 inches wide. The wheels will be driven by two engines of the two-cylinder simple non-condensing type. The wheels are carried by three cast steel flanges mounted on the shaft, which tapers to 11 inches in diameter at the outboard end.

The cylinders of the engines are 18 inches in diameter with 36-inch stroke and are inclined at an angle of 15 degrees from the horizontal, forming an open inverted "V." Each engine develops about 600 indicated horsepower at 90 revolutions per minute when supplied with steam of 200 pounds pressure.

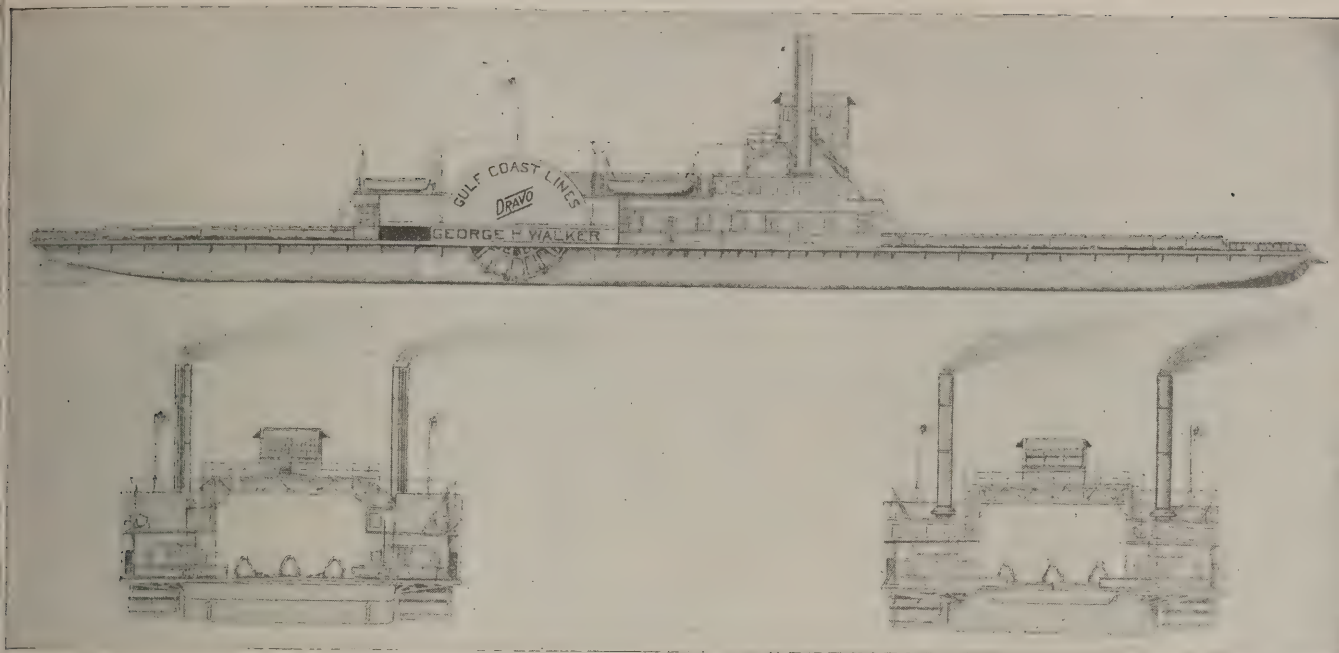
The cylinder and valve chest are cast integral of close grained cast iron, forming a rugged and simple engine. Valves are of cast iron of the piston type. The piston rods and connecting rods are of high-grade forged steel machined all over. All the valve rods and piston rods have metallic packing. The connecting rods, which are of the closed-end type, are fitted with semi-steel boxes and babbitt lining.

SINGLE REDUCTION GEARS USED

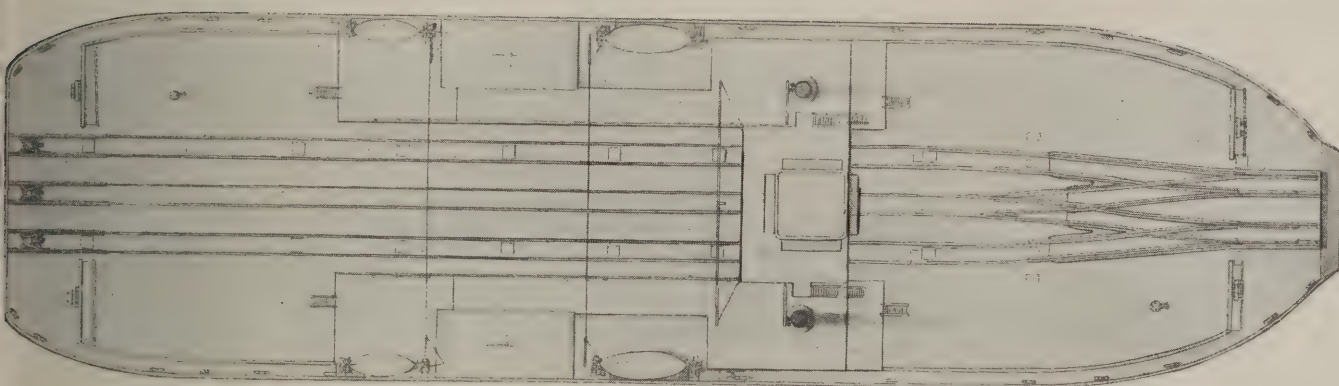
The valve gear is of the Joy type, especially designed for the service, by means of which a wide range of cut-off is obtained whereby the power can be nicely regulated to suit the requirements. The speed of the engine is geared down from 90 to 15 revolutions per minute at the wheel by means of a single set of spur gears. The cylinders and valve chests and all steam pipe are carefully lagged to insure dry steam in the operation of the engines.

All bearings are babbitt lined and well lubricated to effect a reduction of frictional loss to a minimum. All parts entering into the construction of the engines have been designed with a view to economy in operation and easy access for maintenance and overhauling.

The auxiliary equipment of the boat is complete in every respect. One 9 by 5 by 10-inch horizontal duplex Worthington feed pump is installed on each side of the boat. There is one 9 by 5 1/4 by 10-inch horizontal duplex Worthing-



Side and End Elevations of Mississippi River Car Ferry George H. Walker



Deck Plan of Railroad Car Ferry George H. Walker

on sea suction pump on the port side and one on the starboard side for transferring feed water from the river to the Michrone open type feed water heaters. These pumps can also be used for fire pumps. There is also installed a $4\frac{1}{2}$ by $2\frac{3}{4}$ by 4-inch sanitary pump of the horizontal duplex type. Four $4\frac{1}{2}$ by $2\frac{3}{4}$ by 4-inch horizontal duplex pumps are installed for fuel oil service. On each side of the boat there is a feed water storage tank 5 feet in diameter and 10 feet long. The feed water heaters are mounted on top of the storage tanks.

The steering engine is a two-cylinder simple engine—18 inches in diameter with a 7-inch stroke and is located aft between the two tillers. A screw direct connected to the crankshaft actuates two cross heads, one on each side, which move in athwartship direction, and are connected to the tillers by means of links of "H" beam section. The following gear is connected to the control valve whereby the angle of the rudder, as indicated by the tell-tale, can easily be controlled by the helmsman. The steering engine is operated from the pilot house by means of shafts and gears.

There are two balanced rudders of the composite type entirely covered with steel plates and filled with oak, the older stock being $11\frac{3}{4}$ inches outside diameter. There is installed on the boat a 10-kilowatt De Laval steam turbine generator, which provides current for the lighting of the boat and for the search lights.

Every provision has been made to safeguard the passengers through watertight sub-divisions of the hull and through ample life boat facilities. The fire equipment apparatus and life saving equipment are up to date in every respect and meet the requirements of the United States Steamboat Inspection Service. Mechanical davits of the "Steward" type are fitted for all life boats. The interests of the passengers on the cars have not been overlooked as the boat affords a 750-foot promenade during the period of crossing and an artistic hand rail is provided along the deck promenade.

The design and construction of the complete boat, including the boilers and the engines has been handled by the engineering staff and the shops and boat yards of The Dravo Contracting Company and launching was made at their Ohio River Boat Yard on Neville Island before a large audience including prominent guests representing the marine and river interests of the inland waterways, who were attracted because of the unique interest in this piece of river craft which has focused attention on marine construction in the Pittsburgh district.

The boat has been constructed for the Gulf Coast Lines, New Orleans, Texas & Mexico Railroad, with general offices at Houston, Texas, at a cost of approximately one-quarter of a million dollars. As the largest vessel of its type so far built, its performance will be watched with interest.



New Standard Oil Motor Tanker Standard Service

Trials of M. S. Standard Service Show Advantages of Diesel Electric Drive

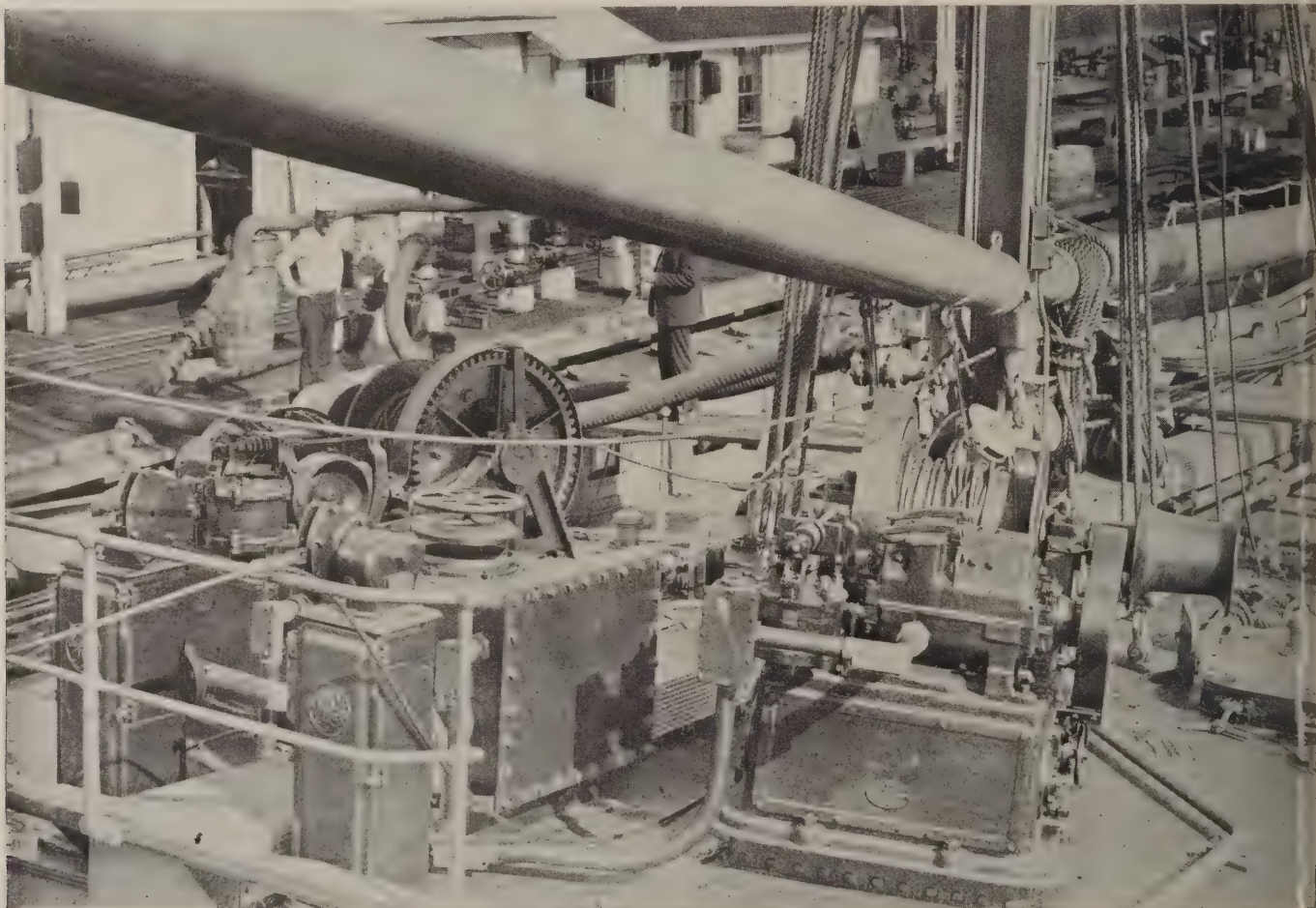
SEA trials of the Standard Oil Company's first Diesel electric driven tanker *Standard Service* were completed off San Francisco on April 2 and have been pronounced eminently successful by both the builders and the owners.

The normal speed of the propeller is 130 revolutions per minute, but during the builders' trial it was operated at

about 145, and the load was less than 1,000 amperes, whereas the full load rating on the motors is 1,065 amperes.

During the owners' trial the craft was well loaded and the full load current was approximately 1,000 amperes with the propeller turning at 145 revolutions per minute.

Readings taken on four different occasions when the control was thrown from full speed ahead to full speed astern showed that at no time did the load go above 1,000 amperes. The change from full speed ahead to reverse took from ten to twelve seconds. During the reversal, all vibra-



Electrically Driven Deck Winches on Standard Oil Tanker Standard Service



Pilot House Control on M. S. Standard Service

ion was eliminated and unless one were observing the instruments he would have no indication of what was taking place on the propelling equipment. One of the directors of the Standard Oil Company, who was steering the boat with one hand and operating the controller with the other, was asked to throw the controller from full speed ahead to full speed astern and was amazed at both the simplicity and the perfect control.

The principal dimensions of the *Standard Service* are:

Length	210 feet
Beam, molded	40 feet
Depth	16 feet 6 inches
Block coefficient	0.76
Lean load draft	15 feet
Loaded displacement	2,725 tons
Deadweight	1,875 tons
Cargo-tank capacity	12,400 barrels
Cargo-hold capacity	225 tons
Fuel-tank capacity	585 barrels
Propelling motor power	600 brake horsepower
Estimated speed, loaded	9 knots
Fuel consumption, running	(24.5 barrels per 24 hours)
Cruising radius	24 days
Fuel consumption, pumping out	15 gals. per hr.
Pumping-out time	6 hours

The tanker is driven by propelling units consisting of two General Electric 300 horsepower motors mounted on the same base and with a common shaft driving a single propeller. Current is supplied by two General Electric 245 kilowatt, direct current generators with a 30 kilowatt exciter connected to each, each generator and exciter being direct connected to a 400 brake horsepower six cylinder four cycle Pacific-Werkspoor Diesel engine.

The main control equipment consists of a control panel in the engine room on which are installed the various switches, field rheostats, instruments, contactors and relays; a panel in the pilot house carrying instruments for indicating propeller speed, line amperes and motor field amperes;

a controlling rheostat for varying and reversing the shunt field current of the two generators; and a propeller speed magneto connected electrically to the speed indicators on the panels.

As the same generating sets which supply the motive power of the craft furnish power also for the cargo pump motors for discharging the cargo, no auxiliary plant is needed. The equipment is capable of discharging the entire cargo in about six hours. Sets of lubricating oil, cooling water, bilge and other pumps are driven by each engine. A storage battery and a small auxiliary generating set is furnished for supplying light when the vessel is not in operation.

Auxiliary Diesel Yacht Hussar

MESSRS. BURMEISTER & WAIN, LTD., Copenhagen, recently launched the seagoing steel auxiliary Diesel yacht *Hussar* for Edwin F. Hutton, of the New York Yacht Club, from designs by and under the supervision of Messrs. Cox & Stevens, of New York. The *Hussar* is built to the highest classification of Lloyd's with the following dimensions:

Length on deck	196 feet 7 inches
Length, waterline	164 feet
Breadth, molded	33 feet
Draft, mean	14 feet
Cruising radius	9,000 miles

She is provided with auxiliary propelling machinery of Burmeister & Wain's yacht type, developing 800 indicated horsepower, anticipating a speed without sails of 11.5 to 12 knots. The engine will drive a two-bladed reversible feathering-type bronze propeller, so designed that when the vessel is under sail the blades may be turned in such a way as to offer no interference to sailing, and at the same time completely fill the propeller apertures. The equipment of auxiliary machinery will consist of two 33-kilowatt Diesel-driven dynamos, and the electrical installation includes Edi-



Diesel Yacht Hussar Ready for Launching

son storage batteries of large capacity, electric boat hoists, equipment for handling sails by power, electric windlass, refrigerating machine of large capacity.

The forward and after overhangs are reasonably short and the stem of the clipper type. The rig is that of a three-masted schooner, having a yard on the foremast for long runs with favorable wind. In order not to exceed the limiting factor for operation in and around New York, the

height of the topmasts permit passing under the Brooklyn Bridge.

In order to meet the owner's intention to make extended voyages at sea, several features were decided upon, including a raised poop deck, allowing dry deck space for the owner and his guests, even in heavy weather. There are provided very comfortable quarters, no expense having been spared in any direction where either seaworthiness, strength, comfort or attractive appearance is concerned.

Another Luxurious Liner for the Italian Lloyd Sabaudo Fleet

DURING the first week in April trials were run in the Firth of Clyde of the Italian Lloyd Sabaudo liner *Conte Verde*, which has been built and engined by William Beardmore & Company, Ltd., of Dalmuir. A sister ship, the *Conte Rosso*, also built and engined by William

class passengers, and a crew of 420—making a total of 2,820.

The first class passengers are berthed in specially large cabins for one or two persons, while certain cabins can be made intercommunicating so as to form suites. Besides, there are a number of special suites, each comprising bedroom, dressing room and bathroom. The first class dining rooms are unique, as the space of three decks is utilized for an upper and a lower dining saloon, thus obtaining for each a headroom of 12 feet 6 inches. The first class public rooms, the designs of which were prepared by Italian architects, include the two dining saloons, a music room, a social hall, a library, and a smoking room with cafe. In addition a large deck area is set aside for recreation and promenade purposes.

The second class passengers have large four-berth cabins, a dining saloon, a lounge, and a smoking room, while the third class berthage is of the open type in large compartments, with appropriate dining and recreation spaces.



Italian Lloyd Sabaudo Liner *Conte Verde*, of 18,500 Gross Tons, Built and Engined by Messrs. William Beardmore & Company, Ltd., Dalmuir, Scotland

Beardmore & Company, has been giving very satisfactory service on the Mediterranean and North and South Atlantic routes. When completed she was regarded as the most sumptuously furnished and decorated vessel built on the Clyde up to that time. The only difference between the *Conte Rosso* and the *Conte Verde* is that the latter has the super-structure considerably strengthened and embodies a slight re-arrangement of the passenger accommodations by the introduction of a few more special cabins de luxe.

She is 591 feet in length over all, 570 feet between perpendiculars, 74 feet in breadth, 40 feet in depth to shelter deck, 26 feet load draft, of 18,000 gross tons, 20,000 indicated horsepower, and 18½ knots speed. She has accommodations for 230 first class, 290 second class, 1,880 third

The propelling machinery consists of two sets of Parsons compound double-reduction geared turbines supplied with steam by six double-ended and two single-ended boilers arranged to burn oil fuel but capable of being changed over rapidly to the use of coal.

SHIPBUILDERS' ACTIVITIES.—At the recent annual meeting of the Atlantic Coast Shipbuilders Association, the secretary briefly traced the organization's achievements mentioning among others its unremitting campaign for development of the American merchant marine, for the stabilization of private employment relations, for improvement in our immigration policy, and its constant insistence that the Government shall not compete unfairly with private business

Economy in Ship Repairs

By Robert W. Morrell, M. E., Marine Superintendent,
Tide Water Oil Company, New York

SHIP repairs fall naturally into four principal groups:

1. Repairs required for the economical performance of the vessel, such as cleaning and painting the underbody to maintain the speed without undue expenditure of fuel; boiler cleaning to secure proper boiler efficiency; renewal of packing to prevent wastage of steam.

2. Repairs required for safe operation, such as hydrostatic boiler tests, periodical classification surveys, compass adjusting, etc.

3. Repairs due to ordinary wear and tear; the maintenance of the vessel in good condition, to prevent undue depreciation or deterioration. For example, scaling and painting the steel hull, keying up of machinery, renewal of zinc plates, and the like.

4. Break-down or damage repairs; the repairing or renewal of parts due to breakage through carelessness or accident, collision, grounding, heavy weather or fire damage repairs.

Obviously, many repair jobs may be classed under more than one of these headings, but the above grouping forms a convenient basis for analysis in any constructive effort to reduce repair costs. By reduction in repair cost

is not meant keeping the repair bills low at the expense of other operating costs. Superintendents have been known to incur extravagant repair bills but by charging them off to capital account, depreciation, stores, insurance or other accounts, claim a wonderful showing on low repair costs. This is of course false economy, and it is necessary to recognize the broad principle that repairs are incurred for the good of the ship as a whole, and that, while it is important to minimize the repair account, any repairs are justified which will reduce the general operating expense. Repairs are repairs, no matter what else they may be called or how charged on the books, and we must avoid any mistaken sense of security in believing we have attained efficiency through low repair bills, so long as the money is going out under another name, without ample justification. It is therefore necessary to consider the repair question from all angles in order to exercise the most thorough supervision.

This article considers the subject of steamship repairs from a broad viewpoint in its relation to the general scheme of steamship operation. Repairs constitute an important factor in the operating costs and have an effect upon the other items in the voyage accounts which must be thoroughly analyzed and taken into consideration, if we are to achieve the maximum efficiency in operation.

The question of just what constitutes repair charges is often difficult to define. The renewal of boilers, pumps, hull plates, or machinery parts, if they increase the value of the vessel, is en-

titled to be charged, in part, to the capital or investment account. The use of paint is directly attributable to the maintenance and upkeep of the vessel, which is one phase of repairs, yet paint is frequently (and quite properly) charged to ship's stores. Renewal of spare parts, and machinery and oil burner parts in general, which are replaced regularly due to wearing out, are frequently bought from the manufacturer and charged to stores; but if the same parts were furnished by a shipyard in the course of a repair job, they would be charged to repairs. It is rather immaterial just how these items are handled, so long as they are all taken into full consideration and not lost sight of in attempting to economize on repairs.

The Interstate Commerce Commission has made rulings governing the method of charging repairs on vessels under its jurisdiction. This is for the purpose of fixing rates for common carriers, however, and does not always apply to the conditions encountered in overseas trade.

It is quite customary to set up a repair reserve account in an attempt to estimate and distribute the repair expense uniformly over the life of the ship. This is good judgment, as it provides a sinking fund to meet the heavier expenses of renewals of worn-out parts when the ship gets old. Such a reserve may be estimated roughly at 15 to 18 cents per deadweight ton per month for freighters, but is of course a matter for individual opinion. This reserve is usually adopted in estimating operating costs for proposed voyages. It is important, however, to avoid a false sense of security if the actual repairs amount to considerably less than the reserve provides for in a given period; they ought to, especially in the early years of a ship's life. It is the actual repairs which eat up the profits, and one cannot afford to sit back with a sense of satisfaction just because the actual repairs make a fine showing in comparison with the repair reserve. We must be eternally on the alert in handling the actual repairs.

Repair expense and depreciation have a relation to each other which should not be lost sight of. A vessel which has been kept in good condition can be sold after a period of years for more money than a vessel on which little or nothing was spent for upkeep. Therefore, a greater expense for maintenance will reduce the actual depreciation, and a clear conception of these relative values will go a long way toward intelligent control of the repairs. As a general principle, however, it may be said that excessive expense toward keeping a vessel in top notch condition will seldom be recovered in the selling price; therefore the expenditure for maintenance should be limited to the amount necessary to keep the ship in efficient operating condition and to avoid premature renewals or replacements.

One of the chief items to keep in mind in fixing a policy for supervision of repairs, is the importance of the time element. Unfortunately, this is often lost sight of, especially on freighters spending two or three weeks in port discharging and loading cargo. On such vessels, the idea too often prevails that a day or two more or less doesn't matter, where as an actual fact a day's expense is just as great on such a vessel as on one in port only a day or two. Every day spent in port is non-productive, but the overhead is going on just the same: depreciation, insurance, wages, provisions, stores, repairs, port fuel.

The marine executives of the United States are now entrusted with the greatest fleet of merchant ships in the history of the nation. The question of ship subsidy is for the present a closed book, and we can only turn to our task and face the future with the determination that, left to our own resources, we will spare no thought or effort, and leave no stone unturned, in making the most of our maritime inheritance and make the American merchant marine an example of intelligent and efficient operation.

The value of time of course depends somewhat on the valuation of the vessel, as the principal items of the overhead are the depreciation and insurance. The war priced ship, at \$200 per deadweight ton, has a tremendous handicap in this respect compared with the ships bought recently at \$35 per ton. Nevertheless, this overhead, whether big or little, goes on every day, and each day spent needlessly in port is a definite loss to the owner, whether the turn-around is 2 weeks or 2 days. On a freight steamer, where repairs can be carried out while cargo is being handled, there should be no excuse for the vessel being detained in port for repairs other than dry-docking or possibly repairs to cargo handling gear. Should such items arise, every effort should be concentrated upon such repairs with a view to quick completion.

The daily out-of-pocket expenses for overhead, etc., should be kept constantly in mind, as this is the only determining factor in deciding to what extent overtime on repairs is justified. It also determines many other points, such as whether it is cheaper to send a vessel to a shipyard for repairs or send the repair men to the ship at the berth; also, whether it is cheaper to furnish steam from shore or tug for discharging in order to effect boiler repairs simultaneously, or cheaper to repair the boilers after discharging. The time element is the deciding factor in every case.

and too great stress cannot be laid upon the necessity of attaching full importance to the value of vessels' time, in handling their repairs.

This emphasizes the previous statement that repairs must be handled for the good of the ship as a whole, as much as for showing cheap repair bills. It is often necessary to incur heavy repair expense to obtain prompt dispatch, but overtime, extra shifting, shore steam, and other expensive items, are well justified, if they really show sufficient saving of the ship's time. These expenses are sometimes good economy. This will be mentioned again in connection with repairs on ships operating on quick turn-around.

Work done on upkeep and repairs is invariably cheaper, if done by the ship's crew than by shore labor, and the signing on of extra sailors, oilers or wipers is therefore often good economy. A good carpenter or a good machinist on board will do a great deal towards keeping repair bills down. Workshop machinery, shop tools, and any repair materials within reason, are an excellent investment on shipboard.

SPARE PARTS TO BE CARRIED

The list of spare parts to be carried on board deserves careful thought, in order to have the right parts at the right time, without carrying a needless amount of "junk." It is far better to have too many spares than too few, however. The principles to keep in mind in selecting spares are:

- (1) What might be needed in case of breakdown at sea?
- (2) What would be most useful to provide against breakdown at an out port?
- (3) What parts could not be obtained quickly in the home port without great expense?

A judicious selection of spares will often save many thousands of dollars on a single item. The question of spare parts is a complete subject in itself, and one which vitally affects the repair situation.

Some repairs, of course, cannot be done by the ship's per-

onnel, and the mates and engineers should be instructed to have clear, complete lists made out upon the arrival in port, showing the work required to be done by a repair yard. The lists must be complete as possible, as it is uneconomical to discover forgotten items just before sailing or even in the middle of a repair job, when too late to obtain bids. A considerable saving in time and money can be affected if these lists are presented by the ship so worded and in such detail that they can be used as specifications in obtaining bids, without having to be re-written and revised.

REPAIRS DUE TO CARELESS HANDLING AT SEA

One of the best ways in which to cut down repair expense is to eliminate the mis-handling of machinery and equipment, and this is a very definite point in which the ship's officers can prove their worth.

A great many repair jobs are purely the result of careless handling at sea, and this is an item of repair cost which can be eliminated at its source. I have in mind the burning out of breechings and uptakes through improper burner and draft regulations, furnace crowns coming down through careless filtering, condensers ruined through lack of rinses, cylinder liners scored and piston and rod packing ruined through a high water-level.

Another source of economy in repairs is to do away with unnecessary alterations which cater to individual fads. A company should have a certain well-defined standard system of connections for

auxiliaries, lay-out of pipe connections, etc., and should adhere to some uniform scheme based on good practice, rather than sanction an infinite variety of pipe connections, and constant alteration of same, to suit the changing ideas of the men in charge. Before making an alteration, it is always advisable to consider how long the ship was running the way she was, and how much of a detriment the item under consideration was to her efficiency. One must exercise judgment, and combine conservatism with progressive initiative, but above all, one must think, not only twice but three or four times, before spending money on repairs.

SHORE STAFFS SHOULD KNOW THEIR SHIPS

It is up to the shore staff to know their ships. The home office should have not only detailed specifications and blueprints of all their vessels, but particulars of all auxiliaries and equipment, giving make, sizes, serial number, etc. There should also be accurate records of dates of last dry docking, United States Inspection, classification surveys, boiler washing, tube sponging, hull scaling, etc., as well as a record of the repairs done to each part of the ship at various times. It is only by having complete and accurate information kept up to date and quickly available that a superintendent can exercise proper supervision over the repair situation. A vessel may be detained a day or two in an outport and, by referring to such data, it might be arranged to take advantage of that time to do some much needed scaling on the bottom or, to carry out some other work that at another time would interfere with the vessel's schedule.

It is also necessary to know at all times just how much re-

pairs are costing on each ship, not only as a whole but for various sub-divisions such as:

Boiler repairs,
Main engine repairs,

Dry docking,
Hull scaling.

This list can be continued indefinitely, and it is useful, if one sub-heading appears high, to sub-divide it still farther. For instance, if boiler repairs seem too expensive, divide it into:

External cleaning,
Internal cleaning,
Mountings,

Calking,
Renewing or repairing tubes,
Renewing or repairing stays.

In this way the item where the financial leak occurs can be traced down and the condition remedied. In keeping such cost records, however, do not rely on your cost department for periodical figures but keep your own record, based on bills approved.

It is decidedly worth while for the shore staff to do their own estimating and to become trained in that line, and this is something to which sufficient attention is not given today. It is quite essential to know what each repair item will cost before authorizing it. Many times, if we realized in advance how much a repair job was going to cost, we wouldn't consider the expenditure justified, and we wouldn't do the job at all, or we would figure out some other and cheaper way of doing it.

An estimate of his own frequently enables a superintendent to handle a job on an agreed price without wait-

ing to call for competitive bids. If a job is done on a time and material basis, such a preliminary estimate gives a good idea as to whether the bill is reasonable. On the other hand, if bids are called, the preliminary estimate may show the bids are all high and it would be cheaper to do the job on time and material.

This brings up the question of taking bids and placing a contract, or working on a time and material basis. There are arguments on both sides, and many features to be taken into consideration, so that the best policy usually depends upon the circumstances at the time. Naturally, on a rush job, with no time to spare, time and material is the best basis; but with time available in which to prepare complete specifications, there can be no doubt that the best results, on the majority of repair jobs, can be obtained by competitive bids and a contract. This implies, however, a first class specification and a thorough inspection. On time and material, the specification is not so important, but inspection is equally necessary and in addition a checking or time-keeping system becomes necessary, and is an added expense. Time and material is in fact the old "cost plus" system, with no end of opportunity to slip in extra charges for foremen, shop tools, lights, excess material, and other items very difficult to check. If time and material basis is used, it is best done by billing actual labor and material plus an agreed fee.

SPECIFICATION SHOULD BE COMPLETE AND ACCURATE

A loose specification is worse than none at all on a contract job, and every effort should be made to have the specification on which bids are called as complete, accurate and specific as possible. If indefinite, the bidders can only pro-

Time is an ever-present and all important factor in ship economics. Every day a ship lies idle, through lack of forethought or initiative or energy on the part of the operator or Master, is a dead loss, an expense without an earning, a black mark against any record of achievement. Indifference to the value of time of our ships in port is one of our worst faults. Time is money, and equally slippery. Too many delays, if analyzed, could have been avoided by exercising a little snappy supervision. Repairs are a fruitful source of delays, frequently unnecessary delays, and offer a wonderful opportunity for economizing time. Don't blame your delays on the repairs. Handle your repairs so there are no delays.

fect themselves by including an amount to cover contingencies left open by the vague wording, so that the bids are higher than the job is worth. All such phrases as "repaired or renewed," or "as may be directed," or "to suit conditions," or "to owners' approval," or "as may be found necessary," should be eliminated unless the meaning is perfectly obvious when looking at the job.

An incomplete specification is the most expensive thing to contend with. Items left out or forgotten have to be done after the contract is awarded, at the contractor's price.

In many cases it is impossible to tell in advance whether certain work will be required, until the job is opened up. In such cases, separate prices should be taken, which can be authorized or not later on as the conditions indicate. Do not include an uncertain item in a specification for fear it will be forgotten. If in doubt whether it will be needed, get a separate price on it. These separate prices may or may not be taken into consideration in awarding the contract, depending on the likelihood of having to carry out such separate items, but at least the separate prices give a good protection, if the work materializes.

Inspection should be well organized. The shore staff should make thorough inspections of the ships while in port, to keep in close touch with their physical condition. The inspection of repairs in hand by a shipyard should be divided between the ship's personnel and the shore staff, with all possible co-operation. On engine room work, the chief engineer should inspect and approve, before closing up, all work on machinery for which he is responsible. The port engineer should likewise maintain a supervisory inspection in order to insure uniform general practise on all vessels of the fleet.

We need closer co-operation between deck and engine departments on shipboard, and between the ship's personnel and the shore staff, in order to get results. All hands are working toward the same end, with a common interest, and those who cater to petty jealousies and mutual obstruction are only standing in their own light and casting a shadow upon the whole profession as well. The home office is usually in a position to get a broader view of a problem or policy than any individual master or engineer, but the sea-going men are better acquainted with their vessels than anyone ashore could hope to be, and their opinions and suggestions should be given every consideration.

SAVE MONEY BY PLANNING AHEAD

Work can be planned ahead to advantage, laying out a dry docking schedule clear of the winter months. Painting in dry dock in freezing weather is usually a total loss. This schedule should also coincide as far as possible with United States inspection and classification survey periods in order to cover everything possible in a single lay-up. It is also worth while to plan in advance to bring about the dry docking, United States inspection and survey in the home port. All repairs can usually be done to much better advantage in the home port, under direct supervision. Repairs in foreign ports are subject to heavy duty.

It is often advisable to let minor repairs accumulate until a dry docking period, as it is cheaper to carry out a group

of items in one contract than to do each small item at a time provided there is no operating loss involved.

The handling of repairs on vessels maintaining a quick turn-around schedule, such as tankers, bulk freighters which load and discharge rapidly, and certain passenger liners represents the highest form of management that demands a well balanced combination of judgment and "pep," and brings out many valuable lessons. The time element becomes magnified, and attention is centered upon maintaining schedule with only a day or two in port at each end and with a minimum lay-up period for overhauling.

QUICK TURN-AROUNDS CALL FOR EFFICIENT MANAGEMENT

It becomes necessary to exercise judgment in determining where to draw the line between driving a ship in continuous operation, and losing time to keep her up. The ability and willingness of the ship's officers to perform their own upkeep and repairs becomes a vital factor. Overtime and other expensive measures become a source of economy in saving time. A well defined policy is essential, and advance planning becomes necessary.

Boiler washing looms up as a determining factor in the planning, and must be handled, if possible, by washing one boiler each time in port. Dry docking, annual inspection and periodical surveys must be combined, if possible. On rush jobs there is seldom time to get bids, and frequently a working agreement with a convenient repair yard is the best policy on rush work.

In order to achieve any sort of operating efficiency it is first necessary to impress upon the masters and deck and engineer officers the fact that it is only through their whole-hearted efforts that our vessels can be kept in operation at all; that unless the vessels are handled with best possible dispatch and minimum expense, they cannot make ends meet and will have to be scrapped. Our officers must understand the value of the time element and must make every effort, first, to keep their ships in first class condition without the assistance of shore labor, and, second, to carry out themselves the bulk of the ordinary repairs, such as keying up, boiler washing, etc. By taking keen interest in details of their ships, the officers can effect valuable savings.

Arrangements should be made, however, for a vessel to radio ahead her repair requirements, and the shore staff should know the vessels well enough to draw up a specification in sufficient detail to obtain bids while the vessel is still at sea, so the contract can be awarded and the repairers meet the vessel upon arrival. It is also common to run repair a voyage ahead; namely, when a ship is in port this time determine the repairs needed next time and get the bid in, so the job is in hand the minute the ship arrives back. Repairs are often postponed from one voyage to the next when feasible, to avoid a Sunday or holiday job, and there is great advantage in allowing minor items to accumulate until dry docking. The whole scheme of repairs in quick turn-around brings out the fine points of efficient management.

HYDROSTATIC BOILER TEST EXCESSIVE

One important factor bearing upon repair economy is the annual hydrostatic boiler test. There is great diversity of opinion as to the advisability of the high test pressure required by law. Most authorities are agreed it is excessive but hardly any two agree on the remedy. The fact remains the test pressure is often responsible for boiler leaks and extensive repairs which would not have occurred otherwise. The writer's opinion is that the test pressure should be reduced and a classification certificate accepted in lieu of boiler test. Until some change comes about, however, the only logical course is to exercise every possible precaution in handling the "squeeze" to avoid damage; namely, (1) very uniform building up of pressure, (2) proper adjustment of gages and safety valve springs in advance to avoid repeated application of pressure, (3) holding the pressure only an in

ant, (4) gradual release of pressure, (5) temperature precautions.

DAMAGE REPAIRS

With reference to damage repairs, i.e. collision, grounding, heavy weather and fire damage, this usually constitutes an insurance claim. There exists an impression that it is economical to hang as many repair charges as possible on the underwriters; but as this is reflected in future premiums, the advantage is likely to be only temporary, if carried to excess, aside from the moral aspect, which is not within the scope of this article. A damage job usually involves many complications of a highly technical nature, and as the hull insurance entitles the vessel to the services of a surveyor at underwriters' expense, it is frequently wise to take advice from a surveyor specializing in this line. The possible variation of difficulties in these cases is too great to cover here, but a general idea of the terms of the policy and a clear conception of the following features should be had by anyone handling steamship repairs:

1. What constitutes a franchise under the policy.
2. Temporary repairs—when and how justified, and when chargeable to underwriters.

3. Disposition of charges for towage, steaming and cleaning tanks, removal and replacement of bunkers, etc. Allowance for diversion to port of refuge.
4. Element of time as applied to collision cases as distinct from other cases.
5. Relation between classification and underwriters' requirements.
6. Protest and certificate of sea-worthiness.

The American Underwriters can contribute their share toward the economical repairs and operation of the American merchant marine to which they owe their existence, by maintaining the highest caliber of men in their executive and technical staffs. It is only by highly intelligent handling of damage repairs and claims that efficiency in this direction can be maintained.

What can the repair yards do toward repair economy? It is to their interest as much as that of any one that our ships be kept in operation, and they must be alive to the fact that they can contribute to that economy of operation without which there can be no existence for the ships or for them. It all boils down to a matter of mutual cooperation. Live and let live. Live and help to live. Play the game on the level. High class efficiency and service will win out.

Efficient Repair Methods Adopted by Shipping Board

By Captain R. D. Gatewood*

Work your crews up to take pride in their vessels; watch the method under which the repair work is awarded; know what the repairs should cost; be sure you have the proper port staff—and then your repairs should cost the minimum.

A SELF-EVIDENT fact is that the successful ship operator is one who, beside filling his vessels, keeps the cost of his vessel operation at the lowest figure. No matter how efficiently or industriously his traffic men work the bottoms, if the result of their efforts is to be turned into a deficit by the losses of physical operation of the vessels, then there is no hope for a paying proposition. This article will deal only with vessel repair costs, and will illustrate to you the enormity of this item there is below the approximate percentage of the cost of physical operation of the Shipping Board fleet:

Operating Divisions.	Percent.
Repairs (including insurance repairs).....	13
Fuel	25
Subsistence	7
Wages and overtime	24
Supplies and miscellaneous	8
Port charges	9
Cargo charges	14

In the general item of repairs are included the following items, with the percentage of the total set opposite each:

Classes of Repairs.	Percent.
Maintenance (voyage repairs)	50
Alterments and alterations	11
Reconditioning	10
Insurance repairs	18
Operation of vessels expense (which includes items such as installing grain fittings, cattle fittings, repairs to navigating instruments, rigging, tackle, etc.)	11
Total	100

The "maintenance" item is wholly chargeable to repairs, is also the greater part of "operation of vessels expense." Alterments and alterations" and "reconditioning" of course

*Director of maintenance and repair, United States Shipping Board, New York.

are capital charges, while "insurance repairs" in the privately owned fleets are not usually paid by the owner but by the underwriter.

The expenditures of the Shipping Board for the general item of "repairs" since 1919 are listed on page 348.

A basis of cost per deadweight ton per month per mile would of course be a fairer basis of comparison, but the large number of vessels operating does not permit obtaining such a figure without undue labor.

An analysis of these figures will indicate a gradual decline in the cost per deadweight ton. This is not an altogether natural decline. The cost in 1920 was staggering and the problem was thoroughly studied from all angles. It was realized that there could be no sedative adopted that would solve the problem in a few months. Whatever was to be done should be so planned that the correction of past practices would be gradual and those concerned would be educated in these policies one after the other when they were ready for them.

There were many self-evident causes of this large expenditure, chief among which were the performance of many alterations which were purely the individual ideas of the ships' crews; the failure of crews to perform repairs that properly should be handled by them; indifference of crew in operation of vessel; inexperience of vessels' personnel; inadequate and inefficient port staffs; high cost of labor and materials; shortage of skilled ship workers; irresponsible repair firms and inefficiency of repair yard organizations; the cost-plus (or so-called "time and material") method of effecting repairs; and many other lesser causes.

Some of these difficulties would of course be straightened out by time alone. We could not govern the cost of labor and material. The curtailing of work and increase of production would solve that problem; irresponsible and inefficient

repair firms would wish by their own hand when the abnormal demand for work would cease; the workers would become more skilled with time and would take keener

MONTHLY STATEMENT OF SHIPPING BOARD EXPENDITURES FOR REPAIRS

Month	Expenditures	Tonnage in Service	Cost per DWT.
1920—January	\$4,787,082.30	8,008,178	\$0.59
February	5,417,507.00	8,426,784	.64
March	6,992,890.26	8,434,958	.83
April	6,571,170.50	8,715,063	.75
May	6,725,899.38	8,776,609	.77
June	5,625,657.78	8,960,995	.63
July	4,508,669.07	9,141,730	.49
August	4,055,757.31	9,028,202	.45
September	5,340,015.50	8,605,546	.62
October	4,397,424.22	8,416,635	.52
November	4,394,474.21	8,401,746	.52
December	3,335,604.04	8,305,405	.40
1921—January	3,415,134.39	8,363,854	.41
February	3,963,295.51	7,739,277	.51
March	4,261,773.93	7,516,620	.57
April	3,198,957.57	7,072,368	.45
May	3,507,093.43	5,974,278	.60
June	2,326,561.94	5,280,058	.44
July	2,686,730.99	5,217,438	.51
August	2,539,950.17	5,262,902	.48
September	2,141,663.27	5,309,160	.40
October	1,801,426.01	5,120,035	.35
November	1,371,870.71	3,815,359	.36
December	1,166,341.42	3,795,941	.31
1922—January	989,137.29	3,376,207	.29
February	1,115,023.66	3,232,235	.34*
March	1,418,626.31	3,306,715	.43*
April	1,398,048.53	3,506,813	.39*
May	2,024,021.01	3,628,186	.55**
June	1,767,272.76	3,704,552	.48*
July	1,037,709.59	3,413,071	.30
August	1,294,669.06	3,291,593	.39
September	919,521.93	3,269,304	.28
October	1,091,160.51	3,305,760	.33
November	1,075,946.85	3,325,009	.32
December	1,307,200.67	3,362,059	.39
1923—January	2,057,157.35	3,517,155	.58
February	1,516,578.36	3,533,604	.43

*The comparatively large expenditures during these months were caused by preparing vessels from lay-up for active service.

**The large expenditure this month was due to payment of one bill for damage repairs of over \$500,000 which had been held in abeyance for a number of months.

interest in their jobs as there ceased to be a demand elsewhere for their services.

But many deficiencies were within our power to correct and our attack was planned along the following lines:

- A—Extend policy of competitive bidding to the practical elimination of all other forms of awarding work.
- B—Eliminate all alterations except the absolutely necessary ones.
- C—Carefully examine repair lists to eliminate all work found unnecessary or which could be performed by crew.
- D—Develop estimating, so that we would know the value of the work to be performed.
- E—Educate the crews to perform all work possible and take an interest in the property under their care.
- F—Insist on the maintenance by operators of efficient qualified port staffs.

Competition is the basis of a successful and healthy industry, so that the extension of this policy was not alone beneficial to the repair costs, but to the ship repair yards and allied industries as well. It has resulted in the elimination of the irresponsible, inefficient organizations who entered this business during the flood tide of war conditions. The ship repair industry is now stabilized, the market is highly competitive and the yards are approaching rapidly their pre-war efficiency.

The very marked decline in repair costs is due to this one thing more than to any other and now from eighty-five to ninety percent of Shipping Board repair work is placed after competition.

Two or three years ago, and to a lesser extent now, the idea was prevalent among the sea-going personnel that the vessels built during the war were exceedingly deficient. This led to an enormous number of requests for alterations and betterments which were mainly inspired in the above belief. Many of them were desirable but were they necessary? Many a man desires a particular make of automobile, but if he cannot afford it, buys a cheaper one. And you can be sure that he makes that one operate to his satisfaction because it is his property. So, the bars were placed against alterations, except where we were convinced that they were absolutely necessary for the proper operation of the vessel, and the protection of life.

The idea seemed to be prevalent among many of the crews that the sole object of placing them on the vessels was to keep the vessels moving from port to port. They took little or no interest in it, feeling that any repairs developing could well be taken care of by shore gangs. Anyway, it was Government property and they did not care if it depreciated although they were joint owners with you and me. But this was not the proper spirit to display.

Could a successful merchant marine be developed with such a feeling? No, and that is why we insisted on vessels crews performing all work properly belonging to them. This has been so inculcated in the crews that we now have relatively few requests for work to be performed by shore forces that could properly be done by the crew. Of course, the increasing experience of our crews has helped, but the average crew now have a greater interest in their vessel and feel to a greater extent that it is their home. Until the spirit of pride in their ship is developed to its maximum among our sea-going people, our merchant marine cannot achieve outstanding success, but great progress along this line is evident to us through the barometer of repairs.

Why do you go to an assayer to have him determine the value of your precious metals? Because you have confidence in his judgment and determination of these values. Accordingly, why should we place repair work in hand without knowing beforehand the value of that work? We have therefore employed and developed in our organization men qualified as estimators, who have full knowledge of the ship repair market and who know what a job is worth. We have in this way rejected bids that were excessive as compared with our estimate and have later obtained more reasonable prices.

A number of vessels under one company without proper technical direction cannot operate to the maximum of their efficiency. Accordingly, we have insisted that the operator have on their port staffs men whose efficiency and knowledge of their business are unquestioned and men who are of the proper port staff type—men in whose good judgment and knowledge of the business the crews cannot help but impose confidence. To my mind the keystone of successful operation rests on the selection of the proper port staff, for with the proper port staff the selection of the proper crews is assured and the maintenance of efficient operation by them is inevitable.

I cannot too urgently recommend American ship operators to pay close attention to the repair of their vessel. As I have said before, this item is one which may cause a large loss in your operating revenue and may determine the side of the ledger on which the balance will show.

The Shipping Board has greatly decreased its repair costs. The methods employed were dictated only by common sense and knowledge of the repair business. They were no revolutionary in any sense. We simply watched our property, sought the leaks, and repaired them. You must grant that with such a large operating fleet as that of the Shipping Board, such efforts were vastly more difficult than would be those of the average private shipowner.

Let your motto be, "Watch the Repairs."

Does It Pay to Have a Satisfied Crew?

By Captain John F. Milliken*

Sooner or later our shipping men will discover that the cheapest men are not always the most economical and that a satisfied crew pays real dividends. The best way to arouse a real interest among the officers and crew is to encourage the men to purchase a few shares of stock. As stockholders of the company most men take a decidedly different view of things.

ALTHOUGH much time and money have been spent by steamship owners and operators in studying problems affecting the shipping industry, the people at the head of the industry in this country have lost sight of one very important, vital fact. The economic operation of ships depends first, last and at all times on the personnel. The finest equipped ship in the world could not be run economically unless the men in charge of the vessel had intelligence and took a real interest in their work and co-operated all the way down the line for economical operation. The leaders of the shipping industry in our country might well bear a page from the records of some of the successful industrial leaders on shore. Many of these most successful men have dropped the autocratic method of handling their help and in various ways have succeeded in making their employees happy and contented.

Conspicuous among others, the United States Steel Corporation is making an effort to meet their employees half way. On the Great Lakes they operate a large fleet of vessels in the ore carrying trade and on these lake steamers the operators for the United States Steel Corporation treat their officers and men with the utmost consideration.

They are paying their officers a little more than the regular lake wage. They furnish the crews with excellent food, supply books and take an interest in any man who is injured or sick while in their employ. The captains of the various ships are consulted in regard to any change in policy affecting their ships. They are called upon to give their opinions as to whether certain men should be retained in the employ of the company or not, when such a man has been in an accident or has had other trouble, and in many cases they are made to feel that they are a part of the scheme of things. It would be hard to find a more loyal or efficient group of men than those who are employed on the steamers of the United States Steel Corporation on the Great Lakes.

This company also operates ships on the salt water where their men are treated, as a rule, with real respect and consideration but co-operation between the company and the men has not been developed to the same stage of perfection which prevails on the Great Lakes.

Secretary-treasurer, Neptune Association, New York.

The Standard Oil Company is another company which has taken cognizance of the welfare of its employees. This company has developed a bonus system whereby the employees are rewarded for efficient service. They are also permitted to purchase a certain amount of stock in the company. The employee pays for half of this stock and the Standard Oil Company pays for the other half. The amount of money which the man pays is deducted from his pay each week and after a certain period of time the employee becomes full owner of his shares.

The plan of paying a bonus met with instant approval on the part of the men on the ships. Every man of the crew on a Standard Oil tanker is entitled to a bonus, if he remains on the ship a year. The Standard Oil Company decided some time ago that it was much cheaper to pay a man a bonus and to try to keep him satisfied with his conditions so that he would stay aboard a ship than it was to change the crews every trip. It is very easy for a new man on an oil tanker to turn the wrong valve and mix up a cargo of oil, or to stop the flow of oil into a tanker and break a pipe line and lose great quantities of oil overboard. Since the bonus plan has been in operation there have been very few changes of masters, chief engineers and first mates. The men are satisfied with their jobs, stand by the ships and they give the Standard Oil Company excellent service for their investment.

This company, it is true, is a little differently situated than most of the regular steamship companies. It is not necessary for them to chase all over the world for cargo and they are not dependent entirely upon shipping for their income.

BIG STEAMSHIP COMPANIES DISREGARD EMPLOYEES

The big steamship companies in this country believe in exercising autocratic power over the men who work for them. Some of the owners pay the men the smallest possible wage that the traffic will bear. When it is necessary for a man to accept these small wages, in almost every instance he makes up his mind to stay on the ship only long enough to make a few dollars. In the case of an engineer, if he is aboard only for one trip, he will not do any more work than is absolutely necessary and he is liable to neglect very necessary things by "passing the buck" to the man who will relieve him. The same thing is true of the deck department where



Captain J. F. Milliken

cargo plans have been lost and freights greatly confused by the changing of the deck officers. This continuous changing of crews is a costly thing and the lack of co-operation and understanding has cost steamship owners large sums.

It is easy enough for the shipowners at this time to disregard the men who work on the ships and to cut wages to such a low figure that it is impossible for the men to maintain a home ashore. If this practise continues, it will be the death knell of American shipping and no amount of subsidy or other aid will be able to save it.

SELECT BEST COMBINATION OF NATIONALITIES IN CREW

The personnel question on American ships is a more difficult problem than in other countries. Here we have a personnel which is composed of people from almost every nation on earth, and for that reason much careful study should be given to this very important phase of the shipping industry. The people who go to sea are human just the same as the people who stay ashore and, while many of the men who sail in our ships have become citizens, in many cases they retain their national characteristics. All of the officers are American citizens, or were after May 7, and as American citizens one man should have as much right as another. The spirit of fair play should prevail and for the good of everybody concerned the wise owner should make a study of what combination of nationalities work together to the best advantage of everybody.

From personal contact with troubles which have developed aboard ships, I have discovered that it does not pay to put an American captain, who originated in Great Britain, in command of a ship where the three mates originally came from Norway. In reviewing the cases of many seafaring men who are on the "deferred employment list" of the United States Shipping Board, I have noticed that much of the trouble was apparently caused by placing a man in command who had no sympathy or understanding with his officers. The lack of co-operation on ships which have been manned in this way has cost the Government a great deal of money.

UNJUST TREATMENT BRINGS RETALIATION

The captain of a ship has a responsible position. He is a buffer between the owner and the men, and in many cases he is made the goat and is forced to pay for something over which he has no control. In one case the captain of a ship was fined \$100 because one of the engineers had pumped fuel oil into the harbor at Norfolk while the captain was away attending to the ship's business. The captain paid the fine and then tried to collect the \$100 from the owner, who flatly refused to pay.

Making the captain pay \$100 for an act for which he was in no way responsible killed all the co-operative spirit which he may have possessed previous to this incident. To get even with the owners he hired a pilot in every port where the ship entered or cleared. He was making a voyage to the West Coast and held pilot licenses which would entitle him to pilot his own ship into several of the ports but he was not in the humor to save money for the owners, even if it had been possible for him to do so. He also hired two tow

boats to dock his vessel when it might have been possible for him to get along with one, and, if the vessel finished loading or discharging during the night, this man would not leave the dock as he was accustomed to do but would wait until the next morning and sail at daylight. On a voyage to the West Coast and back this same captain spent probably a thousand dollars which he might easily have saved, as he arrived in New York two days later than he would have arrived if he had been pushing his ship all the time. The owner, in this particular case, saved a fine of \$100 but paid many times that amount for the lack of understanding and knowledge of the captain's duties, besides creating a feeling of distrust in the mind of the captain.

Another instance occurred where the operators made a special concession to obtain a contract to carry 2,000 tons of print paper to South America every month. On the first voyage over 12 percent of the paper was damaged due to poor stowage and rough handling. On delivery of the second cargo the damage was so great that the contract was cancelled and the company lost about \$3,000 where they should have received a substantial profit.

The officers and crews on the ships, as well as the stevedores, evidently lost sight of the fact that ships are paid to carry and deliver cargoes in good condition and that if this is not done the operators earn nothing. I know instances where the carelessness has been so flagrant and the damages so great that one could almost

imagine that crews had been planted on the ship to destroy the trade.

If a business is always run at a loss, there is no money for employees, the company goes out of business and a number of positions are destroyed. The men should take an interest in their work and use every effort to put the American merchant marine on a paying basis. The best way I know of to awaken a real interest is to encourage the men to purchase a few shares of stock. As stockholders in the company most men take a decidedly different viewpoint of things.

STEAMSHIP OWNERS LACK VISION

I have been lead to believe that the present day steamship owners and operators have no vision when it comes to a question of personnel. It appears as if they were looking only for the profits of today and were making no effort to build up for posterity. At the present time there is absolutely no agreement of any kind between the owners and the crews of their ships. Some of the owners who have charitable hearts contribute generously to various institutions which are supposed to be maintained for the benefit of seafaring men. Some of these institutions are really charitable in their operation, but charity is not understanding and the majority of the seafaring men do not want something for nothing. Charity destroys a man's ambition, ruins his independence and kills his sense of responsibility.

It is a well-known fact that the steamship owners and operators in this country have many very trying and difficult problems. They are courageously battling against conditions which are much worse than any others which have ever been encountered in this or any other country before.

The Eastman Kodak Company has developed a co-operative, profit sharing plan which is recommended to all industries. Questions of all kinds are discussed between the managers and the men, but Mr. Eastman has gone the usual plan of this kind one better. He has stated that the co-operative theory is all right but a few extra dollars in the pay envelope of the workers make for a real co-operation. If the Kodak Company makes a profit so that the shareholders receive dividends, the workers, or the men responsible for the production, also receive a dividend. The output of the Kodak plant has increased 25 percent under this plan and there has been no loss to stockholders or workers due to strikes.

Heroic efforts have been made by certain private owners and by the United States Shipping Board to keep American ships in operation but they have failed so far in enlisting the real co-operation of the sea-going personnel. Establishing clubs and associations of their own, which are poorly patronized and little thought of, will not bring to the operators the co-operation which they need so badly at this time. The shipping men of this country have many very serious problems to consider but they should not neglect the problems of personnel, for it will be almost impossible for the steamship business to prosper without the proper kind of men working harmoniously with the operators aboard the ships.

One of the most feasible ways to establish this co-operation would be to recognize the organizations which the men have built up and by making agreements with the men through these organizations and living up to such agreements after they are made. If the proper sort of co-operation had been in existence between the steamship owners and the sailors' union, Andrew Furuseth, in all probability, would not have appeared in Washington to wage such a strenuous fight against the ship subsidy bill, and the other associations which so heartily supported this measure would have been in a better position, financially and otherwise, to render this very necessary legislation more effective aid.

Economies Practiced by Successful British Shipowners

English Correspondent Outlines Methods of Effecting Operating Savings—Note Ease of Obtaining Concessions from Parliament

By Our British Correspondent

ECONOMY is at all times a praiseworthy endeavor, but never more so than when the fight goes to those who are able to effect a saving where others cannot—or at all events do not. I propose, in the first part of this article, therefore, to place on record some of the essentials leading to economies as practiced by successful shipowners. It should first be made clear, however, that there is no royal road to economy, that is to say, it is not an automatic process, but is a question on which considerable time and protracted deep-thinking must be expended.

One of the most noteworthy economies is in regard to insurance, and especially in connection with particular average. Only those owners with a good record extending over a number of years are able to arrange their insurance upon the cheapest lines, and even then much depends upon the age of the steamers. Owners possessed of a fleet of modern vessels are in a far better position than those who are handicapped with steamers of a greater age. Obviously it is a dangerous procedure for shipowners possessing, say, one or two vessels to run them unless fully covered against all risks, but, in the case of the larger ownerships, the particular average risk, varying from 50 percent to the whole of it, is, in fact, successfully undertaken. They have in the past probably been able to build up a substantial reserve fund, enabling them to look with equanimity upon the risk involved by running part or the whole of their own particular average, and which risk, spread over a fleet of, say, fifteen or twenty modern steamers, is a fair and reasonable one to take. With a company owning a single ship, or two or three ships, this is a risk or liability that cannot be legitimately undertaken, otherwise they might be faced at any moment with liabilities in consequence of particular average damage far beyond their resources. But it is quite another question when the risk is spread over a large fleet, and, without mentioning names, it is permissible to say that, as I have indicated, this procedure is engaged in by prominent shipowners in the United Kingdom.

Dispensing with freight advances is another direction in which important economies may be effected, but this is a difficult matter in such unpropitious times as the present, when owners in many cases have little option but to sacrifice appreciable sums in commissions.

CONFINING VESSELS TO PARTICULAR TRADES

Then, owners may economize as a result of keeping their vessels in one trade over a series of voyages, and, furthermore, of confining the boats to the trades for which they are

most suitable. For example, if a vessel is thoroughly fitted up for carrying grain, it is a paying proposition on economical grounds to confine her trading as entirely as possible to the carriage of grain cargoes. I have known of many cases where steamers have been diverted into other trades, probably by force of circumstances, and on returning to the grain trade owners have been staggered by the expense incurred in replacing shifting boards and grain fittings, especially in the North Atlantic trade. This is obviously a very real economy, but, as in the case of freight advances, it is again a question of owners being in a position to pick and choose.

Periodical surveys, too, should be watched in the matter of the carriage of certain cargoes, or heavy additional expense will be incurred in "passing through." In the British North America trade, many owners effect substantial economies by the payment of the extra premium of insurance immediately on the opening of the season, thereby enabling them to spread the premium over the season and work in several trips at the cost of one.

SUPERFLUOUS BUNKERS

Then there is the question of economies to be effected by ascertaining that the quantity of bunkers carried is not superfluous. In one case within my recollection there was a discrepancy of nearly 100 tons in the quantity of bunkers actually carried and the returns of the total deadweight (cargo and bunkers) which were sent to the owners each voyage in accordance with instructions. The owners were for an appreciable time unable to lay their finger on the "spot," but eventually did so, incidentally discovering that the engineer, in order to be on the safe side, had been "nursing" a superfluous 100-ton margin on each voyage. He was "fired," and the carriage of bunkers was placed on an economic footing.

In regard to the general question of coal bunker economies in the matter of purchases, it was the practice years ago to contract ahead for quantities to cover several months, but the policy in these days is, owing to various causes, to live almost from hand to mouth. It is, on the face of it, an unbusinesslike method, but, with the present-day ups and downs, the measure has been found to justify its incidence.

CLOSE SURVEILLANCE OF STORES A PAYING PROPOSITION

Stores is another branch in which keen surveillance is imperative, and in which the expenditure of a salary to a sea-going man in the shipowner's office—usually a captain or chief engineer who has been many years in the service—has proved to be a paying proposition. The larger companies,

of course, possess in most cases a marine superintendent, and are, therefore, in safe hands—if they possess the right type of man. But in the smaller fleets down to single-ship and two-ship concerns, where the appointment of a marine superintendent in the generally accepted sense of the term is impracticable, it undoubtedly pays to have a man in the office who can point his finger to items in the captain's inventory renewals and say: "This is unnecessary," or "That is essential." The average landsman would be "at sea" with such a list before him, but not so the man who has been to sea and who knows to a rope what is required and what is not.

In the matter of shelter deck vessels there is also scope for economy, for, unless intelligence is shown in the selection of cargo, this type of vessel is at some economical disadvantage to a single deck vessel. It is a fact that many shelter deck steamers seldom run in the trades for which they are specially suited, but here again force of circumstances is probably the deciding factor. It is significant, however, that keen and discerning time charterers, who study expenditure in every detail, decline to take double decked steamers where a single decker is preferable.

CONCESSION IN SHIPPING FEES BILL SECURED

A direction in which British shipowners as a body have effected an important economy since my contribution appeared in this magazine a month ago is in regard to the short and sharp fight around the provisions of the Shipping Fees Bill. This measure, embracing charges for such services as the measurement of tonnage, surveys, and so on, imposed, in its original form, an annual charge on shipowners of £420,000 per annum, as against the £90,000 yearly charge hitherto incurred. But, as a result of representations made to the President of the Board of Trade by the Shipowners' Parliamentary Committee, working in conjunction with the Chamber of Shipping of the United Kingdom, a substantial concession has been secured, and in the bill as amended the annual charge is reduced to half the original sum, that is £210,000, or £120,000 per annum more than shipowners have thus far paid. The bill in its amended form is now receiving the approval of shipowners, and the measure will, there is little reason to doubt, eventually find its way to the Statute Book. The burden of the charges may be gaged from the following new maximum scale provided in the schedule to the bill:

MEASUREMENT OF MERCHANT SHIPS

	£	s.	d.
Vessels of 50 tons gross and under	2	0	0
Over 50 tons gross and under 100 tons	4	0	0
Each additional 100 tons or part of 100 tons above 1,000 up to 10,000	1	0	0
Each additional 100 tons or part of 100 tons above 10,000	0	10	0

PASSENGER STEAMER'S CERTIFICATE

Steamer not exceeding 50 tons gross	4	0	0
Exceeding 50 and not exceeding 100 tons gross	8	0	0
Exceeding 100 and not exceeding 300 tons gross	12	0	0
Exceeding 300 and not exceeding 600 tons gross	15	0	0
For every additional 300 tons or part of 300 tons above 600 an additional	3	0	0

SURVEY OF EMIGRANT SHIPS

For ships holding valid passenger certificates:			
Ordinary survey	12	0	0
Special survey	20	0	0
For ships not holding valid passenger certificates an additional fee			

REGISTRATION, TRANSFER AND MORTGAGE

On initial Registry:			
Vessel not exceeding 25 tons gross ..	2	0	0
Exceeding 25 and not exceeding 50 tons gross ..	2	10	0
Exceeding 50 and not exceeding 100 tons gross ..	3	0	0
Exceeding 100 and not exceeding 200 tons gross ..	4	0	0
With £1 for every additional 100 tons or fraction of a 100.			

On transfer, transmission, registry anew, transfer of registry, mortgage, and transfer of mortgage. According to the gross tonnage represented by the ships or shares of ships transferred, etc.

	£	s.	d.
Not exceeding 10 tons	0	5	0
10 tons and not exceeding 20	0	10	0
20 " " " 30	0	15	0
30 " " " 40	1	0	0
40 " " " 50	1	5	0
50 " " " 75	1	10	0
75 " " " 100	1	15	0
100 " " " 125	2	0	0
A further fee of 5s. for every additional 50 tons, or part or 50 tons, up to 500 tons, after which for every 100 tons, or part of 100 tons	0	5	0

New Development in Marine Boilers Designed to Increase Economy of Operation

MARINE boilers have certain limitations which are not found in land plants; therefore, a boiler to meet marine conditions must meet the limitations aboard ship. The principal requirements of marine boilers different from that found in land practice are space, weight, steady steam demand, feed water and to some extent character of the personnel which is usually not as well trained as the average shore engineer.

In land plants it is usually customary to have spare equipment to meet the varying load conditions found during the peak loads, but this is not necessary or desirable aboard ship. First because the load or steam demand is fairly constant, and second, space and weight available prohibit spare boilers. It is desirable, therefore, to design marine boilers for a fixed steam capacity which will give the maximum economy and to operate them at that capacity constantly while at sea.

Owing to there being no spare boiler equipment, reliability is the most important factor in a marine boiler. Both weight and first cost have in the past been sacrificed to reliability, as is evidenced by the great number of Scotch marine boilers that have been used. Many attempts have been made to use watertube boilers, and in recent years this type of boiler has been more frequently installed in spite of the fact that it requires a better grade of feed water and more intelligent operation than the older Scotch marine type.

NEW TYPE OF SUPERHEATER AND ECONOMIZER

To meet marine conditions and obtain the same economy which is now found in the large central stations ashore, a new development in marine boilers has recently been brought out by the Foster Marine Boiler Corporation. They have improved their boiler with a new type of superheater and economizer arranging all three devices in one compact steel casing as shown in sectional side elevation, Fig. 1.

The principal change in the boiler heating surface proper has been made in reducing the height of the tube bank and increasing it in width, also in depth. This gives a low wide boiler, adds approximately 50 percent to the water storage in the boiler proper, giving it nearly the same water reserve as the Scotch marine type. Also by lengthening the tubes a greatly enlarged furnace volume is obtained, and the space available aboard ship is taken up more efficiently. Another interesting feature of the heating surface is the opening up of the lower rows of boiler tubes to allow the radiant heat to penetrate further into the tube bank, thus reducing the load on the lower row of tubes which, it is claimed, will overcome most of the present difficulties found with burning and blistering of these tubes when scaled. This is clearly shown in Fig. 2.

The general design of baffling as shown in Fig. 1 is the well known Foster steel plate type in which the baffles are cooled by the boiler tubes top and bottom. With this form

of baffling, it is claimed, if any repairs should be required in the lower row tubes, there will be no repairs or renewals required by the baffling.

The furnace design is radically different from present practice as a Foster radiant heat type superheater is installed in the rear wall, which enables any degree of superheat desired to be obtained and reduces considerably the furnace temperature. Repairs in the brickwork furnace lining will be reduced, it is claimed, due to the cooling effect of this furnace wall superheater in conjunction with the extra tube surface exposed in the lower rows of the boiler.

BOILER IS PRIMARILY AN EVAPORATOR

The steam boiler should be primarily an evaporator and not a combination of feed water heater and evaporator. Many land plants have installed economizers to add the required sensible heat to the feed water up to or close to the

will be increased, it is claimed, as the waste gases leaving the economizer will be from 250 to 300 degrees Fahrenheit instead of from 500 to 600 degrees as found in present marine boiler practice. Assuming an average stack temperature of 550 degrees as now practiced and 300 degrees with the new boiler, there will be an approximate fuel saving of $7\frac{1}{2}$ percent, as generally it has been shown by experiment that there is a reduction of 1 percent in fuel used for each 30 to 35 degrees reduction in stack temperature. There will be a further gain due to the heat absorbed by the superheater. This gain, through increased or higher superheat than is now used, will be mainly shown in the engine or turbine where all of the superheat appears in useful work. Reducing the stack gases to the lower temperature possible with this new boiler unit will not only help to increase the economy when proper combustion is maintained in the furnace, but in the case of inefficient operation such as when

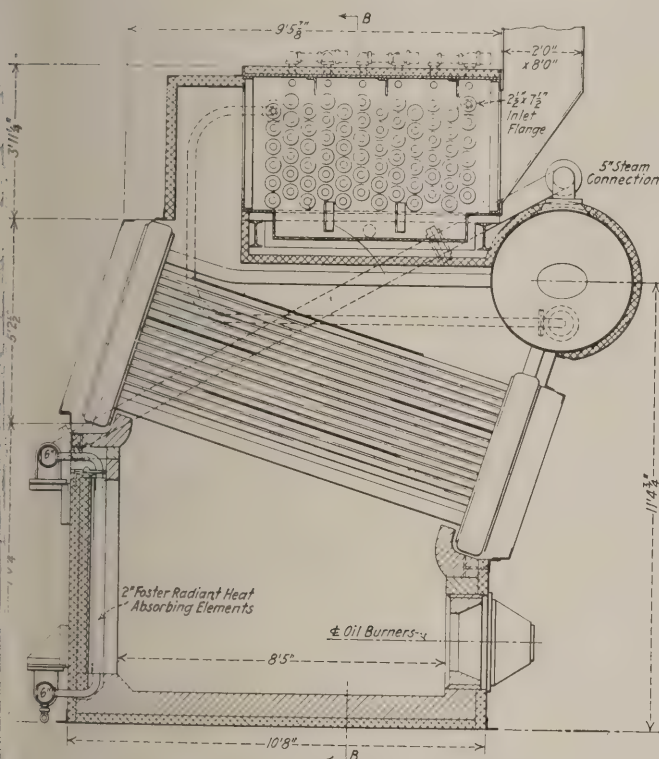


Fig. 1.—Side Elevation (Section Through A-A, Fig. 2) of Foster Marine Watertube Boiler with Superheater and Economizer

temperature of the steam, which leaves to the boiler only the work of adding the latent heat of vaporization. The boiler heating surface is best adapted for evaporating work only, and the separate heating surface of an economizer is best adapted for reducing the temperature of the stack or waste gases to the minimum point and adding the sensible heat of the water before evaporating. This splitting up of the heat absorbing surfaces into two parts, a boiler and an economizer, results in a material gain in economy at a moderate increase in cost and, if the water velocity in the economizer is kept at its proper rate, most of the scale forming matter, such as carbonates, etc., will be deposited on the economizer surface as a soft mud, and will not pass into the boiler where it would be baked on in the lower row tubes as a hard scale. The addition of the economizer also gives a large storage of hot water available for immediate use which results in steadier steaming and also helps the water reserve of the complete unit. This new Foster combined unit with its economizer has a larger water storage, it is claimed, than the present Scotch marine boiler.

The efficiency of this new Foster steam generating unit

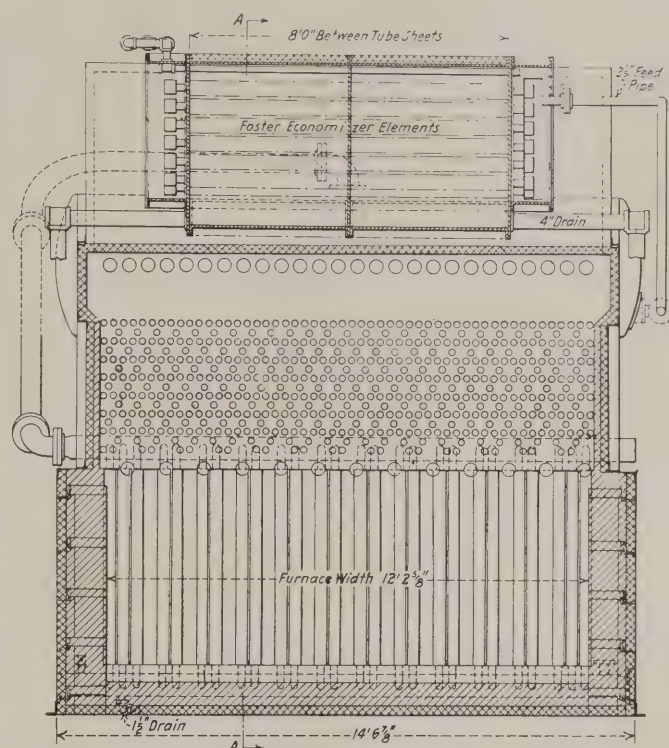


Fig. 2.—End Elevation (Section Through B-B, Fig. 1) of New Foster Marine Boiler, Designed for 250 Pounds Working Pressure and 150 Degrees F. Superheat

large quantities of excess air are used will tend to reduce the losses of inefficient operation due to more of the heat in the excess air being absorbed by the economizer before passing to the stack. In other words, the losses due to inefficient operation will not be as great owing to the final temperatures being nearer to the original temperature of the air used for combustion than is found in present practice.

BOILER EFFICIENCIES

The new Foster improved boiler unit, it is claimed, will have an efficiency of from 85 to 90 percent depending upon the fuel used and the completeness of combustion. Its weight and space required will be approximately the same as the present Scotch marine type, its gas outlet being at about the location of that of the Scotch type which lends itself to the shortest flue to a central stack.

Marine fuels are more expensive than in the past and, therefore, fuel economy is of greater importance than before the war. With approximately 600 pounds pressure and 250 degrees superheat a modern marine steam plant, it is claimed, can produce power for the same fuel cost as a Diesel engine.

Effect of the Propeller on Economical Ship Operation

By E. A. Stevens, Jr.*

TO obtain economical results, two things are required: first, to reduce the fuel per indicated (or shaft) horsepower, and, second, to reduce the power required to drive the ship at the desired speed. The result of the two is to get the greatest mileage per ton of fuel. In many cases the second point is overlooked and, when the machinery is being operated quite efficiently, it is the more important of the two.

Two things can be done to reduce the power required to drive a ship; one is to keep the underwater body of the ship clean, the second is to make a change in the propeller where it is not giving good results. By making this change, the speed can often be materially increased and at the same time the fuel consumed per day reduced.

WHERE RECIPROCATING ENGINES WERE INSTALLED IN PLACE OF TURBINES

During the war a large number of ships were built that were intended to be driven by geared turbines with a propeller speed of 90 revolutions per minute. In many cases reciprocating engines were installed in place of turbines, but no change was made in the propeller or the position of the tail shaft. The result was that the engines were not able to operate under economical conditions, and, in order to prevent them from running at too high a number of revolutions, they were never allowed to obtain full power.

In some cases the pitch was increased in order to correct this fault, until a new propeller could be made and installed. This increasing of the pitch, however, made it necessary for the engines to deliver more power as the propeller was working in what is generally known as "cavitation" of the kind that Admiral Dyson calls "dispersal of the thrust column." However, the total fuel consumed was, in some cases, less, as the engines were working under more favorable conditions. The wear and tear was also reduced. In most of these cases the location of the shafting was such that it was impossible to put on a wheel of the proper diameter, and therefore broad tip blades had to be used.

ILLUSTRATIONS

Example 1. This ship was fitted with a propeller of the following characteristics: Diameter, 17 feet; pitch, 15 feet 9 inches; projected area ratio, .342; number of blades, 4. From the trial results it was discovered that this wheel was working in cavitation so a new wheel was designed. As the diameter was limited to 17 feet 6 inches it was necessary to broaden the blade tips. The new wheel had four blades, a pitch of 15 feet and a projected area ratio of .36.

The maximum speed obtained on the trial with the old propeller was 9.41 knots with 2,126 indicated horsepower, while with the new wheel it is estimated that this speed could be obtained with 1,930 indicated horsepower, a saving of $9\frac{1}{4}$ percent. To maintain a sea speed of 10 knots it is estimated that with the old wheel the power required would

It is not generally realized what a significant part the propeller plays in the efficient and economical operation of ships. It is just as important **to reduce** the horsepower required at a given speed and draft as it is to reduce the fuel burned per indicated horsepower. Change in propeller sometimes means a saving of 15 percent in the fuel. The examples given in this article are good illustrations of the savings that can be effected by installation of properly designed propeller wheels.

be 3,080 indicated horsepower (which was impossible with the boilers and engine while only 2,610 indicated horsepower would be required with the new propeller, this being a saving of $15\frac{1}{4}$ percent.

Example 2. This ship was originally fitted with a four-bladed wheel of 16 feet diameter, 14 feet 6 inches pitch and a projected area ratio of .368. With this wheel she made 8.23 knots at sea in smooth water and burned 42 tons of coal in 24 hours. The above wheel was replaced with a four-bladed

one with broad tips, the diameter of which was 17 feet, pitch 15 feet 3 inches and the projected area ratio was .392. A speed of 9.25 knots was obtained with this wheel while the coal burned was reduced to 38 tons per diem. The saving in fuel was $9\frac{1}{2}$ percent, while the effective horsepower delivered by the propeller was increased about 40 percent.*

Example 3. This ship was fitted with a four-blade propeller, the pitch of which was 19 feet. On the trial trip a speed of 11.19 knots was obtained with 2,695 indicated horsepower and 69.75 revolutions per minute. The mean referred pressure was 39.2 pounds. As this wheel was working in cavitation a reduction of the pitch to 17 feet would have reduced the indicated horsepower required to 2,555, increased the revolutions to 74 and reduced the mean referred pressure to 35.2 pounds. This would mean that the engine could be run with advanced cut off in the high pressure cylinder, thereby reducing the water rate, while the revolutions would not be excessive. At sea the saving in power would be even greater than that mentioned above.

Although examples 1 and 3 are estimates, it is believed that the actual results will be practically as shown. These were calculated by the Dyson method of propeller analysis and design which the writer has found to be quite accurate. Some of his investigations were shown in a paper presented last fall at the Transactions of the Society of Naval Architects and Marine Engineers entitled, "The Application of Dyson's Method to Propellers of Ocean Going Merchant Ships."†

SAVING CAN OFTEN BE MADE BY CHANGING PITCH

Very often a saving can be made in the fuel bill by changing the pitch, thereby increasing or decreasing the revolutions without decreasing the power required to drive the ship. This was done in the case of a geared turbine driven cargo ship where the pitch was reduced from 14 feet 6 inches to 13 feet, which resulted in a saving of 10 percent in the fuel, while the power required was about the same for the same speed and draft.

Another case is that of an 8,800-ton deadweight cargo ship that was fitted with a very large reciprocating engine, the low pressure cylinder of which had a diameter of 80 inches and a stroke of 48 inches. The propeller was a four-bladed wheel of 17 feet diameter, 15 feet 9 inches pitch and a projected area ratio of .34. The power re-

*Senior Engineer in Charge of Propeller Work for Emergency Fleet Corporation.

*After making allowances for conditions of ship's bottom.

†Reprinted in MARINE ENGINEERING AND SHIPPING AGE, April, 1923.



Removing Propellers on Twin Screw Passenger Steamer in Dry Dock

quired to drive this ship at a sea speed of $10\frac{1}{2}$ knots was about 2,620 indicated horsepower, and the revolutions per minute, about 77.5. This would require about 27.9 pounds mean referred pressure. It was not considered advisable to run this ship at a greater speed on account of the high number of revolutions. As no larger propeller could be installed a broad tip wheel is being made with the same diameter as the old one but with 16-feet 9-inch pitch and a projected area ratio of .39.

It is estimated that with this propeller 2,680 indicated horsepower would be required to obtain $10\frac{1}{2}$ knots at sea, while the revolutions would be about 71.5 and the mean referred pressure 30.8 pounds. With this wheel a speed of .1 knots could be obtained with about 75 revolutions per minute. While the power required for $10\frac{1}{2}$ knots is increased about $2\frac{1}{2}$ percent the engine will be working under better condition, and the fuel burned will probably be much less, while the wear on the engine will be considerably reduced.

TWO COMMON FALLACIES

Before closing, I wish to call attention to two very common fallacies. The first is that low slip means a high efficiency. While this is true in some cases, it is not always so. For instance, two ships, one having finer lines than the other, both having the same power and revolutions, the one with the finer form will run with more slip while the propulsive efficiency will be greater as the power augment factor (generally called the thrust deduction factor) would be less. In the case of high speed propellers, increasing the diameter will result in decreasing the slip, but the

efficiency will decrease after a certain diameter is reached.

The second fallacy is that a pitch ratio of over unity is necessary in order to obtain high efficiency. While it is true that high propulsive efficiencies are generally found where the pitch ratio is over unity, it is not due to this but to the fact that the hull in such cases is so shaped that the flow of water to the propeller is not disturbed enough to materially increase the power required had the propellers been operating in undisturbed waters. It has been mentioned on more than one occasion that in both destroyers and freight steamers where the pitch ratio is about 0.8 that the propulsive efficiency is not generally over 53 to 54 percent.* This is true, but it should not be overlooked that there is a difference between propulsive efficiency and the propeller efficiency.

In the case of the destroyer the power augment factor is unity, therefore the propulsive efficiency is the same as the propeller efficiency. The low efficiency, however, is not due to the low pitch ratio, but to the high tip speed and thrusts. In the case of the freight steamer the low efficiency is due to the effect that the hull has on the flow of water to the propeller which, in many cases, increases the power at least 25 percent over that required if the propeller was not so affected, so, if the propulsive efficiency in this case is 54 percent, the propeller efficiency would be 67.5 percent, which is about as good as can be expected. The pitch ratio from what has been said can be considered an incident and not a cause.

* Propulsive efficiency = $E. H. P. \div I. H. P.$; if $E. H. P. \div S. H. P.$ is used, these figures would be 57.6 to 58.7.

An Economizer That Requires No Outlay

High Grade Lubricating Oils Intelligently Used in the Engine Room Will Promote Efficiency and Cut the Operating Bill

THE cost of poor marine lubrication is disastrous. An attempt to economize on the first cost of lubricating oil for ship machinery is about the most expensive mistake in which an operator can indulge. It is a fuel waster, a speed destroyer, a booster of repair bills and a loser of profits.

When a turbine driven vessel such as the *Robin Adair* is able to show a log of 170,000 miles on the low speed unit where the tooth pressure is 1,000 pounds per lineal inch without appreciable wear, the machinery must have been properly lubricated.

One hundred and eighty thousand miles without replacements of any kind has been recorded by the double reduction geared turbine ship *Niels Nielson*. Proper oil and efficient operating methods are entirely responsible for such a showing.

The adoption of a high grade lubricant will effect a direct saving in consumption as evidenced by the cost sheet of the motorship *Renfield* where the oil consumption was reduced from 28 gallons of lubricating oil a day to 14 by a change in the quality of oil used.

The record of the trial trip and maiden voyage of the steamship *Alleghany* of the Furness Withy Line contains an interesting example of the results possible from the adoption of efficient engine room lubricating methods and quality oils. On her trial trip this ship exceeded her contracted speed, making 14.7 knots, developing about 3,000 horsepower. From Liverpool to Boston on her first run she averaged 14 knots and consumed only 4 gallons of lubricating oil per day.

How do these ships get results—what are the methods and the oils used in efficiency performances of this nature?

ONLY SMALL QUANTITIES OF OIL NEEDED

If all the oil used on marine equipment accomplished its function without waste, comparatively small quantities would be necessary. Oiling at regular intervals should be the rule of the staff. When fed by hand the oil film will cling to bearings and continue to perform its function for a limited period. With an automatic feed, regulated carefully, the consumption can be kept low while accomplishing a maximum effect. In circulating systems where repeatedly purified by mechanical or filtration methods, lubricants last indefinitely, requiring but small quantities for replacement, provided the quality of the oil is correct for this service. With the idea of adequate lubrication without waste in mind, the high grade oils for given uses become the most economical.

The first cost of a lubricant is of comparatively minor importance, however, when the effect of lubrication on the machinery is considered. The slightest delay in port made necessary by burned out bearings or any other cause due to faulty lubrication rapidly overtops the lubricating oil bill covering a long period.

PLACES WHERE FRICTION LOSSES ARE GREATEST

In reciprocating engines where the problem is largely one of external lubrication, the opportunity for conserving oil through a careful study of oiling methods is great. From the engine to the propeller, friction losses occur in the piston, packing glands, crossheads, valve gears, eccentrics, main bearings, crank pins, thrust bearings, line shaft bearings, stern tube stuffing box and stern tube bearings. The prob-

lems of maintaining bearing adjustments, piston clearances spring tension and the like at exactly the correct point to prevent overheating and, at the same time, eliminate pounding are too well understood to require comment. It is sufficient to say that the maintenance of shaft alinement and careful adjustment of moving parts is the first duty of the staff. On the matter of selecting the proper lubricant and feeding it to accomplish the best results there is a vast field for the improvement of methods now generally employed.

METHODS OF INTERNAL LUBRICATION OF RECIPROCATING STEAM ENGINES

The internal or cylinder lubrication of reciprocating engines is accomplished by a variety of methods—hand oiling, tallow cups, hydrostatic lubrication and mechanical forced feed instruments.

The inefficiency of oil cups as a method of cylinder lubrication is evident. The cup is filled, the cover replaced, the cock at the base opened and the oil permitted to flow into the cylinder or the steam chest. This system lacks regularity, results in a waste of lubricant and demands frequent attention. With hand swabbing, using cylinder oil, the rods and packings are well lubricated but this method is hardly satisfactory for cylinder and valve lubrication. The practice of swabbing the rods requires regularity and only with an oil of absolutely correct quality will the lubrication of an engine by this method be satisfactory.

Such an oil must have great spreading ability, the properties necessary for maintaining a lubricating and sealing oil film under high pressure and temperature, the ability to resist the washing effect of cylinder condensation, the quality to furnish maximum lubrication with a small supply, non-carbonizing properties and the ability to quickly separate from condensed steam in order to avoid boiler troubles.

If oil of the same quality were introduced into the steam line by means of a mechanical force feed lubricator in quantities much smaller than those required for the inefficient hand swabbing method, correct lubrication of all parts would be assured without danger of introducing any oil into the boiler.

EFFECTS OF VARIOUS LUBRICATING METHODS

For use when starting an engine or when there is a tendency for internal parts to squeak, hand oil pumps are often installed. With this method more oil than is actually required is pumped into the engine with the usual result that the excess finds its way into the condenser with the exhaust steam. The hand pump must always be used with careful judgment.

The hydrostatic lubricator is connected to the main steam line and depends for its action on the replacement of oil with condensate from the steam line. This type of lubricator must be started and stopped by hand. It is not absolutely regular or uniform in its delivery of oil, as changes in temperature, leakage or an obstruction in the delivery passage alter the rate of feed. It must be kept under observation to insure good results.

Force feed lubrication is accomplished by the use of a mechanical lubricator, consisting of an oil reservoir and a small plunger pump for each oil feed, operated by a lever and ratchet motion which is attached to some moving part of the engine. There is a sight feed glass by which the rate of feed may be observed. There is also some means by

NOTE—The information used in the preparation of this article was supplied by the Vacuum Oil Company and the Texas Oil Company of New York.

which the stroke of each plunger may be regulated to increase or decrease the feed.

When a good type of mechanical lubricator is selected, this method of lubrication is automatic and absolutely regular in its delivery of oil. The stroke may be adjusted to deliver any desired quantity of oil and by trial a very high degree of economy can be attained. Temperature changes do not influence the feed of a good mechanical lubricator.

TYPES OF OIL BEST ADAPTED TO PROPELLING MACHINERY

For the lubrication of the marine steam engine two oils are necessary, one for steam cylinders, valves, valve and piston rods and packing glands, and one for crosshead guides, wrist pins, crank pins, main bearings and valve gear.

The high steam temperature and pressures employed, require the use of a heavy bodied cylinder oil which must form a lubricating and sealing film, even when moisture is present.

Adhesion to the friction surfaces in the presence of moisture is most commonly obtained by compounding the oil. In the case of marine engines, however, compounded oils are generally considered objectionable because they do not readily separate from the water of condensation in the hot-well, in which case the boilers become coated internally with oil, resulting in poor heat transfer and overheated metal. For this reason a highly refined mineral cylinder oil is generally used which has been manufactured from selected crudes by methods adapted to develop its adhesive and lubricating characteristics to the greatest possible degree.

For the lubrication of the external parts of the marine engine, friction and wear are reduced to a minimum and the bearing temperatures are kept within reasonable limits best by the use of a high quality heavy bodied compound lubricating oil. While it is sometimes attempted to describe such an oil by specifications, giving the viscosity and other physical characteristics, the only satisfactory basis for the selection of an oil for this purpose is the established service record of the oil. Manufacturers who specialize in high grade lubricating oils may be consulted to advantage and it is generally safest to accept the results of their extended experience in the selection of the oil.

Although the oils selected in this way may cost more per gallon than would another oil, correct lubrication can be attained by their economical use, resulting in less expensive lubrication in the long run than by the use of a cheaper and less suitable lubricant. A further and greater return to the operator is the decrease in repairs and increase in useful life of the engine, as a result of correct lubrication.

STUDY OF WICK FEED OILERS PROFITABLE

In connection with the lubrication of bearings and external engine parts, the opportunity for improvement in the use of wick feed oilers is considerable and in a large measure depends on the work of the individual engineers. As with other methods, the rate of feed should be maintained practically constant and only of sufficient volume to lubricate the bearings adequately. This is seldom if ever accomplished. When the cup is full the oil flows freely, dropping off as the level falls. If at the low levels the bearings are receiving sufficient oil, then when the rate of flow increases with the higher levels the conclusion must follow that oil is being wasted. It is almost safe to make the statement that nine

out of every ten wick feeders supply more oil than is necessary, that is, assuming high grade oils are used. The possibility of changing the number of strands in a wick and of determining the proper length wick to give the correct flow and avoid fluctuation is of great importance. It has been determined that the lower end of the wick adjusted at a distance of about 2 inches below the lowest oil level will increase the uniformity of flow at all levels. Greater wick lengths than this do not alter the effect appreciably, while if the wick is much shorter, there will be an excessive variation of oil flow between fillings.

The study of wick feeders can be carried to the point of taking out the strands of the wick, one at a time, watching the effect on the bearing temperatures and, when the bearing begins to overheat, replace one strand of wick for safety. Once the proper balance is obtained, the flow will remain practically the same if the lubricant used is of the same quality.

There is no given set of rules applicable to the lubrication of ship machinery or a specific oil or grease that is standard for any and all services. There are fundamental principles of good lubricating practice, however, and suggested applications of various oils especially adapted to particular types of machinery in the following outline of the lubrication problem that will suggest possible economy measures to the operator and to the engineer.

The lubrication of the thrust bearing is extremely important, since this bearing takes the entire driving force that propels the ship. There are three general types of thrust bearings; first the plain type, in which the thrust rings or collars fixed on the shaft are fitted in recesses in the lower and upper bearing sections; second, the horse-shoe type, in which the thrust rings bear against collars of horse-shoe shape, which can be adjusted separately; the third, bearings of the Kingsbury, Michell and

Gibbs types, which are specially designed to assure automatically the even distribution of pressure on the bearing surface. The plain type is used in some small installations, the horse-shoe type is very common in reciprocating engine installations of all sizes, while the special types of the third group are common in modern steam turbine practice and are meeting with increasing acceptance for reciprocating steam and Diesel installations.

For lubrication of thrust bearings the common methods of application are oil bath and wick feed oilers. Plain and horse-shoe thrust bearings generally have an oil bath. The revolving collars pick up oil from the bath and force its circulation through grooves, from which it is distributed. For starting, oil is delivered to the bearing surfaces by wick feeds, which are generally provided, assuring that the bearing will not be scored before the oil from the bath is properly distributed. The special types of thrust bearings mentioned are generally lubricated by bath, sometimes supplemented by forced circulation of the oil. The oil reservoirs of large thrust bearings are often provided with water cooling coils for maintaining moderate oil temperatures.

Where plain or horse-shoe thrust bearings are oiled by bath or wick feed, a rich lubricant with heavy body should be employed, correctly compounded so that it will form a lubricating emulsion with any water that may be present. These requirements usually call for the same oil as should be used for the main engine bearings and guides. Occasionally, when the duty of the thrust is especially severe, a still heavier and more strongly compounded oil will relieve the difficulties encountered.

It is specially important that the oil used on the plain and horse-shoe type of thrust be of a high grade, well adapted to this particular service, because an unsuitable oil will not attain a satisfactory emulsion. Under continued operation this emulsion will tend to become heavier and heavier, until the oil ways become so clogged that the only lubrication remain-

ing is that furnished by the wick feed oilers. Overheating and loss of the bearing is the probable result. This condition of the oil necessitates cleaning out the bearing and renewing the oil. The correct oil for this purpose will form a fairly thick emulsion, still retaining its flowing and lubricating qualities during long periods of service.

The special types of thrust bearings mentioned are nearly always constructed with a tight casing which keeps water out. The use of a large oil reservoir for the bath also facilitates the separation of any water that may accidentally enter the bearing. The bearings may be well lubricated by the use of a pure mineral oil of lighter body than that for the other types of bearings. For turbine installations this is generally the same oil as that on the main turbine bearings. The use of a high quality oil for this purpose assures long useful service.

OIL REQUIREMENTS FOR TUNNEL BEARINGS

The general type of tunnel bearing installed in connection with the average reciprocating steam engine is of the plain spring type. Tunnel bearings are generally lubricated with marine engine oil or a tunnel bearing grease or both. If oil is used it is ordinarily applied by means of wick feed, the top half of the bearing cap being built with an oil box cast in it. A good oil can be reclaimed and used several times.

Where grease is used in the tunnel bearings it is comparatively hard in composition, having a very high melting point. Grease lubrication may keep the bearing surfaces in good condition, but always results in greater frictional power loss than with the use of a suitable oil. For this reason bearings built for grease lubrication are often fitted with wick feed trays, made to fit the grease recess, so that oil can be applied.

TURBINE LUBRICANT REQUIREMENTS

The high surface speed and small shaft clearances in direct connected turbines require a light bodied oil that will circulate readily. It must also be of the proper quality to maintain an oil film with minimum fluid friction on the turbine and thrust bearings.

Direct connected turbine drive vessels are not economical, as the turbine must be run at too slow a speed and the propeller at too high a rate for efficiency. Turbo-electric drive ships are not in extensive use so the discussion of the lubricating problem will be confined to geared drive vessels.

Reduction gears may be either single or double. A usual ratio of speeds in double reduction gears is 3,500 revolutions per minute on the high speed shaft, 500 revolutions on the intermediate and 100 revolutions on the low speed shaft. Herringbone gears are in general used for reduction although straight tooth spur gearing has been used to some extent.

The oil that would normally be selected for the turbine bearings alone is sometimes of too light a body for the reduction gears, where the tooth pressures range from 500 to 750 pounds per linear inch. The duty of the oil in the gears is not only to maintain a lubricating film, but also to form a cushion that will prevent shock and wear on the tooth surfaces. Since it is generally impractical to use separate oils on bearings and gears, a reasonable compromise is made by using an oil throughout, which is of sufficient body to satisfy the gears requirements. The oils that have been found most satisfactory for this service have a viscosity between 250 and 300 seconds Saybolt at 100 degrees F. On slow running gears which normally have higher tooth pressures, and on gears poorly cut or badly worn, heavier oils are sometimes found advantageous.

Oils as heavy as the foregoing result in unnecessary fluid friction in cool bearings. In many geared turbines, the bearings are so located that they are kept warm due to the heat from the turbine. The effect of this is to reduce the operating body of the oil, creating a condition such that the heavier oil selected for gear lubrication also satisfied the

bearing requirements without causing excessive fluid friction.

It must never be assumed merely because an unknown oil has a viscosity within a prescribed specification range, that it will give satisfactory performance in the turbine. For long continued satisfactory service there is no place where it is more important than in the steam turbine to employ a high grade oil that has been carefully developed for the exact performance intended. A safe choice cannot be made on the basis of any set of specifications. No laboratory tests are equal to the service results accumulated from the records of many machines of the class, covering long periods of time.

SYSTEMS OF LUBRICATION EMPLOYED

The most important factor in arriving at good lubrication of turbine units is the provision of a thoroughly reliable system both for the turbine and the gears. Pressure and gravity circulation systems are most extensively employed for oiling. In the gravity circulation system, the lubricant is carried to a gravity tank located high enough to obtain about 15 pounds' pressure which is necessary to supply the parts to be lubricated. The oil is then permitted to flow through the bearings and gears to the sump. The oil from the sump is returned by means of a pump through strainers, a separator and a cooler, to the gravity tank, thus providing a constant circulation of the lubricant. A gravity circulation system in a steam turbine usually contains about 1,800 gallons of oil, while a pressure circulation system contains somewhat less oil because of the elimination of the gravity tank. Because of the fact that the oil is constantly in motion in these systems a special kind of oil and a special treatment of that oil must be provided.

The pressure system of lubrication is cheaper than the gravity since less equipment is required. In operating this system, the lubricating oil pumps draw the oil from the sump or drain tank or purifying system and apply it to the unit under pressure, the oil draining back to the drain tank where it is again picked up by the pumps and again applied to the unit. The circulation of oil through this system is therefore continuous.

The proper quantity and quality of lubricant must be maintained in the turbine system and for the auxiliaries. Some pressure installations are fitted to operate with too low a capacity of oil. On the average ship the system should be of ample size to handle from 800 to 1,000 gallons in continuous circulation. Certain units at present are operating under as low as 400 gallons in the system and this provides so rapid a circulation of oil that after it has come in contact with the heated bearings it does not have time to settle and cool and therefore is subject to rapid deterioration. To function properly, the pressure system should pump oil to the bearings in excess of that required, a relief valve or other means being provided to drain the excess oil back to the sump tank.

In turbine driven vessels the oil that is used for the main drive may also be used for most of the other service on board. The average replacement of new oil should not exceed 15 gallons per day in ordinary cargo ships.

On ships equipped with refrigerator spaces three types of oil in general are required—that for the main turbine drive and auxiliaries, ice machine and possibly cylinder oil. As the lubricant used in the steam turbine system must be a straight mineral oil it is not considered wise to carry a supply of oil on board that will emulsify, not even in cases where horse-shoe thrust bearings are used because of the possibility that this oil might be accidentally placed in the turbine system where it would cause trouble.

An excellent method of controlling the treatment of oil is to place a sample from the low point in the turbine system in a long small clear glass bottle for observation. The sample is allowed to settle for four hours and each engineer is thus able to maintain an accurate check on the condition of the oil and any changes that might have occurred in the system.

If water is getting into the system, it may thus be discovered immediately and the cause of the water determined and the evil eliminated or given the necessary attention.

The oil used must separate easily and quickly from water and other impurities picked up in the system. Water in the system with the oil tends to form an objectionable mixture that clogs the screens and forms a slime on the cooling coils, thus reducing the efficiency of the cooler as a heat-extracting device. In extreme cases, the free circulation of the oil is interfered with by the slime so formed, and lubrication is affected.

SYSTEMS OF PURIFYING THE OIL BY FILTRATION

Three methods of filtering the oil in the lubrication system may be resorted to. In the periodic batch filtration system, the entire charge of oil in the system is drained at definite intervals when, in the judgment of the operator, it is deemed advisable to recondition the oil. After all the oil has been drained from the system and the parts thoroughly cleaned, new oil is introduced. To filter used oil it should be heated to a temperature of from 160 to 180 degrees F. which hastens the water separation and improves the purity of the oil when subjected to filtration. This method requires two or three days for completion and so is not generally applicable.

In the continuous filtration system all the oil is passed through a combination settling and filtering tank. The quality of the oil is effectively maintained in this way while the large volume used in the system provides a relatively long time for settling out impurities. The filter should be cleaned of impurities regularly.

The continuous by-pass system of filtration provides for a small quantity of oil to be constantly withdrawn from the system through a small filter and returned to the sump. This oil is taken from the lowest point in the sump tank or from the bottom of the gravity tank where solid impurities or water will naturally be found. If impurities are present, idle periods may be utilized to recondition all of the oil. With this method oil can be in continuous service for several months without appreciable deterioration.

Centrifugal oil separators may also be used in conjunction with any system of filtration. They provide a satisfactory method of purifying oil at sea and a positive system for purification when in port. In even a moderate sea the gravity settling system is rendered inefficient by the motion of the ship, while under favorable conditions in port the pressure of gravity is not sufficient to effect complete purification. With the centrifugal system it is possible to purify the oil continuously or by the batch method as desired.

The arrangement commonly used places the purifier on the same level as the turbines. When it is operated continuously with such a system the course of the oil is roughly as follows: Coming from the turbine bearings it flows into the oil drain tank and is pumped by either of two steam pumps through the oil cooler into one or the other of the two overhead tanks shown at the right of the diagram. From a point slightly above the connection of this tank the oil flows back through the strainer to the turbine. A stream of oil is constantly drawn from the bottom of the tank and passed into the purifier where water, dirt and other sludge are centrifuged out. The purified oil is delivered into the drain tank and goes back into the overflow tank along with that coming from the turbine bearings.

FACTORS DETERMINING SERVICE OF LUBRICATING OILS

When starting up a new turbine for the first time, there are always present in the system impurities of many kinds such as core sand, scale, chips, fibers, etc. It is good practice after the trial run to remove the entire supply and subject it to filtration or centrifugal purification.

It is well to keep a check on the records of oil consumption in order to eliminate any irregularities caused by leakage of water in or oil out. Evaporation losses are relatively small in a turbine system, particularly as the oil temperatures, reduced by the cooling, are much below the temperature of vaporization.

Oil foaming in the system may be due to air leaks. Where foaming persists it may be prevented by the use of vents in the oil tanks and by operating at higher oil temperatures which has a tendency to cause the bubbles to break up quickly. Water finds its way into the circulation system in spite of every precaution and the careful construction of packing glands. Constant supervision must be maintained to keep down the amount of water present. Water and a highly refined oil emulsion will readily separate when allowed to rest. When an inferior grade of oil is used, however, in which finely divided insoluble substances are present, an emulsion of a permanent nature is formed. To prevent this, pure mineral oil of high grade and special manufacture must be used. The elimination of emulsion and sludge from a circulation system is necessary to maintain the proper efficiency of the oil, as these impurities will precipitate in the oil reservoir, in the strainer or filter, on the cooling coils or in the bearing housing, all seriously affecting the reliable operation of the turbine.

The lubrication of Diesel engines and auxiliary machinery will be discussed in a later issue of this magazine.

The Leviathan—The New Flagship of the American Merchant Marine

WHEN our next issue reaches its readers, the reconstructed *Leviathan*, now the largest ship in the world, and perhaps the fastest liner afloat, will be ready to sail on her maiden voyage from New York to Cherbourg and Southampton as the flagship of the American merchant marine. In the hands of the Newport News Shipbuilding and Dry Dock Company, and with the aid of a host of subcontractors, this vessel has been completely reconditioned so that she represents the last word in safety, luxury and convenience for travelers at sea. In the July issue of *Marine Engineering and Shipping Age*, will be published a complete profusely illustrated description of the passenger accommodations of this magnificent contender for the blue ribbon of the seas. Details of the structural changes and the reconditioning of the propelling and auxiliary machinery of the vessel were published in our November, 1922, issue.

New Furnace Front for Dahl Oil Burner

Greater Accessibility and Better Air Regulation Secured by Swinging Feature of New Front

A NEW type of swinging furnace front has recently been developed by Bethlehem Shipbuilding Corporation, Ltd., for use in installations of the Dahl mechanical oil burning systems, which are manufactured at their Moore plant, Elizabeth, N. J. This front is suitable for use with

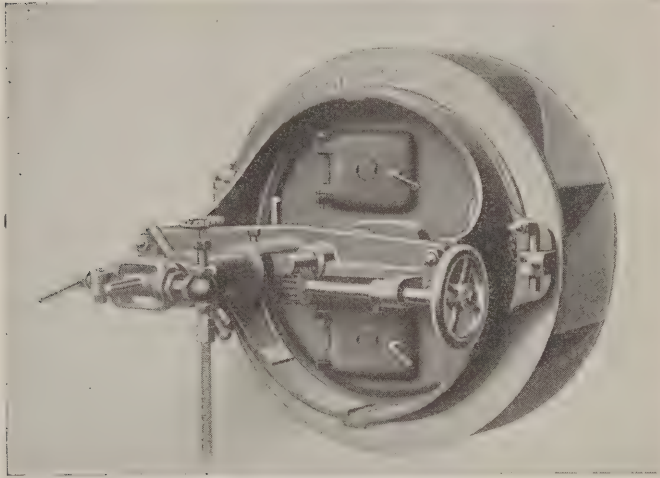


Fig. 1.—Swinging Type Furnace Front for Natural or Forced Draft Installations, Shown in Operating Position

either natural or forced draft, or with a combination of both. The swinging feature of the new front, in addition to retaining all of the desirable features of the non-swinging type, possesses special advantages in regard to accessibility and air regulation that the other type does not.

The air register is a substantial cylindrical casting having nine air vanes cast integral with two flanges of rugged design, the front one of which acts as support for the swinging pot, the rear one being bolted to the boiler furnace front.

A cylindrical regulating pot air check governs the amount of air admitted by opening and closing the air inlet. The air regulating pot is controlled by means of a hand-operated rack and pinion.

The cylindrical air regulating pot and air regulation pot head are separate castings, clamped together by two dogs. The air controlling gear and cone adjusting gear are the same in both swinging and non-swinging types.

The swinging front permits of air regulation when working under natural draft, forced draft, or combined natural and forced draft, and under all conditions of operating it may be swung open to permit of easy access to the furnace interior without dismantling any part of the boiler front. When working on natural draft installation, the cylindrical air regulating pot and air regulation pot head are one casting. Regulation of the air is accomplished by adjusting the air regulation pot. In this case the air is admitted through the register vanes which are open to the boiler room.

Withdrawing the pot and pot head along a cylindrical bracket placed in the center of the crossbar, by means of the rack and pinion, and swinging them open permits of inspection and easy access to the interior of the furnaces without dismantling the boiler front or fuel oil piping.

When operating under forced draft, the register is enclosed by the air duct, and adjustment for air control is by means of the rack and pinion which operates the air regulating pot and pot head. Closing the air regulating pot over the register vanes cuts off the forced draft and permits of swinging the air regulating pot head, burner and regu-

lating cone clear of the register for inspection without destroying draft conditions on other furnaces being supplied from the same duct. The swinging clear of the pot head and door frame permits of inspection and access to the furnaces without dismantling the furnace front or fuel oil piping. To do this, the two dogs are thrown clear of air regulating pot, the latch bolt is disconnected and the air regulation pot head is withdrawn from the air regulating pot. While these various movements are taking place, the air regulating pot seals the register, thus preventing leakage of air during examination of burner and regulating cone.

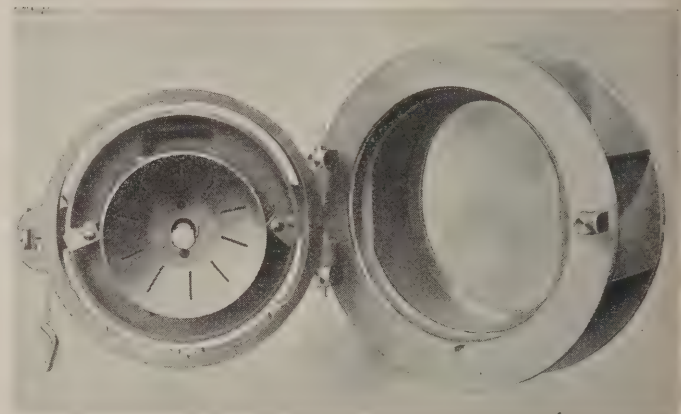


Fig. 2.—Swinging Type Furnace Front in Open Position with Air Regulating Pot in Closed Position, Showing Easy Access to Furnace Interior

When working under natural draft on a combined forced and natural draft installation, the air regulation pot remains in the closed position shown in Fig. 1, shutting off the forced draft through the air duct. The two dogs are disconnected and the air regulating pot head is withdrawn for the admission of air, by means of the hand operated rack and pinion, thus giving a definite air control.

If for any reason it is found desirable to admit a still greater quantity of air, the two doors in the air regulating pot head can be opened. Access to the interior of the furnace is obtained as described above.

A number of installations of this design of furnace front have already been made with excellent results, demonstrating ease of operation, flexibility of control of air regulation, complete atomization and high efficiency resulting in a practically smokeless flame and the highest attainable percentage of CO_2 at the stack.

Arc Welding Applied to Shipbuilding

BEGINNING in the July issue of *Marine Engineering and Shipping Age*, Mr. E. W. Ewertz, general manager of the Moore Plant, of the Bethlehem Shipbuilding Company, Ltd., will present a complete summary of the application of welding to ship construction, a comparison of welding with riveting, a description of the arc welded ships already in existence and their performance, a review of repairs to the German liners and the results of tests in England and the United States to demonstrate the adequacy of welding as applied to ship construction, a description of the several designs of welded ships, a comparison of the advantages of welding versus riveting and finally a bibliography of the subject.

A Direct Course Is A Direct Saving

By Robert B. Lea*

All the carefully worked out engine room and shore economies are seriously affected if the captain of a vessel is not able to direct his ship over the shortest ocean course between ports.

GREAT advances have been made in the last century in the art of ship propulsion, but there have been no corresponding contributions to aid the captain and commander of a vessel. In fact the advances in the engine room in several respects have increased the captain's burden of responsibility, for the greater speed which modern machinery has given to vessels has gone beyond the power of the feeble magnetic compass to respond as quickly as it should. Secondly, the metal and machinery which have replaced the old time wooden hull and sails have introduced grave magnetic disturbances, the compensation for which robs the magnetic compass of much of its already feeble directive force. For this reason the gyro has long been indispensable on war vessels and over one thousand ships of the world's navies are using the gyro compass. Here the compass is used not only for navigation but to direct the very accurate gunfire control.

Directly after the war the gyro compass was first tried in the merchant service and its contributions found to be

so unique and substantial that already 36 of the world's leading fleets have vessels navigated by gyro.

ADVANTAGES OF GYRO NAVIGATION

The economies and advantages of gyro navigation can be briefly stated as follows:

First, the gyro compass makes possible true north navigation. For the small gyro wheel in the master compass ever maintains its axis with a definite relation to the earth's axis, thus affording freedom from those ever-present worries—variation and deviation. The elimination of these two factors does much to reduce the mental hazards of the navigator. And every aid is worth while which will simplify the responsibilities of the master of a modern vessel representing the large capital investment that it does.

Secondly, since the gyro compass is so many times more powerful than the magnetic it responds to the slightest yaw of a vessel, thus enabling the quartermasters to steer a much straighter course. An idea of the difference in directive force is given in the treatise as published a few years ago by Commander T. A. Lyons of the U. S. Navy. The Sperry

*Manager, Marine Department, the Sperry Gyroscope Company, Brooklyn, N. Y.

Steering by Magnetic Compass

Steering by Gyro Compass

Mk VI, or merchant type compass, has 137 times the directive force of the U. S. Navy standard $7\frac{1}{2}$ -inch liquid compass used in the tests.

The accompanying illustration shows comparative records made by a tanker. It will be noted that the vessel was yawing on an average of about 5 degrees when steered by magnetic and this was immediately reduced to an average of $1\frac{1}{2}$ degrees when the quartermaster was allowed to steer by gyro.

A ship appears to be ever anxious to yaw off her desired course *without really changing her direction of motion*. Unless she is prevented from doing this by the prompt action of helm, she cuts a much wider swath through the water. This, of course, means power loss. One large transatlantic liner reports a saving of $1\frac{1}{2}$ to 2 percent of fuel consumption due to straighter steering.

Another economy results from this straighter steering which is brought about by a more prompt application of the helm



Steering by Gyro, Captain Examining Course Record in Background

than is the case with the sluggish magnetic: namely, a smaller amount of rudder is used. This affords an appreciable reduction in the number of propeller revolutions required to drive a vessel a given distance and can be readily realized by those who have observed the retarding effect of drag from a rudder at wide angles. One coastal liner finds that she now requires on an average of 5,000 fewer revolutions on a run of about 900 miles.

DEAD RECKONING MADE ACCURATE

The third contribution of the gyro compass to economy is the ability of a captain to more accurately navigate by dead reckoning, especially when the weather is such that check sights cannot be taken. This is perhaps best expressed in the report of a captain of a large intercoastal freighter:

"I wish to state without any hesitation that never before have I seen a vessel make the courses or the landfalls that I have seen made this trip. When I expected to make a light at such and such a time and bearing such and such a degree, true to form there it would be right on the dot. If I figured



Steering Repeater, Reveals a Yaw of One-Sixth of a Degree

to pass five miles off of that light when abeam, five miles it surely would be.

"I read somewhere that dead reckoning with a gyroscope was raised from an indefinite quantity to a mathematical accuracy and I want to corroborate that statement. Since leaving New York I have steered between 15 and 20 courses and upon recapitulating find that the course made good in



Master Gyro Compass. This Instrument Controls Steering Repeater, Bearing Repeater and Course Recorder

all but two instances has always been the exact course steered by gyro. This, to me, is a phenomenal surprise."

Or perhaps the following taken from a foreign technical paper:

"Not the least interesting of the many up-to-date appliances shown to me on board was the Sperry gyro-compass, which, by giving a more precise line of route unaffected by magnetic deviation, saves the ship about 80 pounds sterling a trip."

Another advantage of special interest to the management on shore is that the gyro compass makes possible the use of a machine that records every heading or change of heading of a vessel over a long period of time.

COURSE RECORDER ELIMINATES INEFFICIENCY

The latest "course recorder" affords a continuous record for 30 days on a single strip of paper. Several companies have already made use of these records in court where the visual evidence was of great value in proving the position and heading of a vessel at the time of accident. The presence of this instrument in the wheelhouse has been found to serve as a continuous moral stimulant to the quartermasters' alertness. What is more important, it enables a captain to eliminate inefficient wheelmen with their costly steering, for it is found that some men seem unable to acquire the knack of holding a vessel closely to a required course.

The chart reproduced at the beginning of this article

shows this striking difference in quartermasters while the vessel was proceeding under the same weather conditions.

"METAL MIKE"

To carry these savings further, the Gyro Pilot, or automatic steering device, has been developed and is about to be introduced. This mechanism has greater alertness than a quartermaster in giving a vessel the proper helm. And neither does "Metal Mike," as this iron quartermaster has been dubbed by captains, get tired after a two-hour watch, or become drowsy around 4 a. m. On several ships thus equipped the wheel has not been touched by human hand for days at a time.

The fifth type of saving is effected when pilots, through their greater confidence in the gyro compass, particularly when making sharp channel turns, bring their vessels up through the fog or haze to the dock when otherwise they might feel inclined to drop anchor. Many instances of this are reported, such as a recent case where a captain was able to land his passengers in the late afternoon while another vessel approaching the entrance buoys at the same time, but not equipped with a gyro compass, felt obliged to drop anchor until morning. This gain in time for unloading mails, passengers and cargo may well represent large sums.

It is thus interesting to realize that the principle of the street vender's toy has been put to work and contributes to the more economical and safer navigation of merchant vessels.

Oil Engines Designed for Large Liners

Seven Thousand Brake Horsepower Double-Acting Motors and 3,000 Brake Horsepower Single-Acting Plant

By Our Special London Correspondent

DURING the past two or three years, interest in oil engine construction has chiefly been centered around motors of moderate power and, generally speaking, up to about 2,000 brake horsepower. It is probable that this represents the widest field of application for marine internal combustion machinery but, in view of the demand that has arisen for motor passenger liners, considerable attention has lately been devoted to the production of engines of high power.

Undoubtedly the most noteworthy example is the new Burmeister and Wain double-acting four-cycle type. As previously mentioned, two motors of this design of about 7,000 brake horsepower are to be installed in a passenger liner for the Swedish-American Line, and it is now possible to give some details and illustrations of the 1,100 brake horsepower single-cylinder experimental engine which the builders have constructed, before proceeding with the manufacture of six-cylinder sets of practically the same design.

HIGH PISTON SPEED ADOPTED

The engine develops its power at 125 revolutions per minute and has a bore and stroke of about 33 and 59 inches, respectively. It will be noted that this gives the exceedingly high piston speed of between 1,200 and 1,250 feet per minute, whereas in most of the marine Diesel engines that have previously been built, the figure has seldom exceeded 800 or at most 850 feet per minute. With their wide experience, Messrs. Burmeister and Wain would not have adopted such a piston speed, if they were not confident of its suitability, but it is generally considered that piston ring wear is a function of speed, and it will therefore be interesting to learn whether any difficulties are encountered in actual

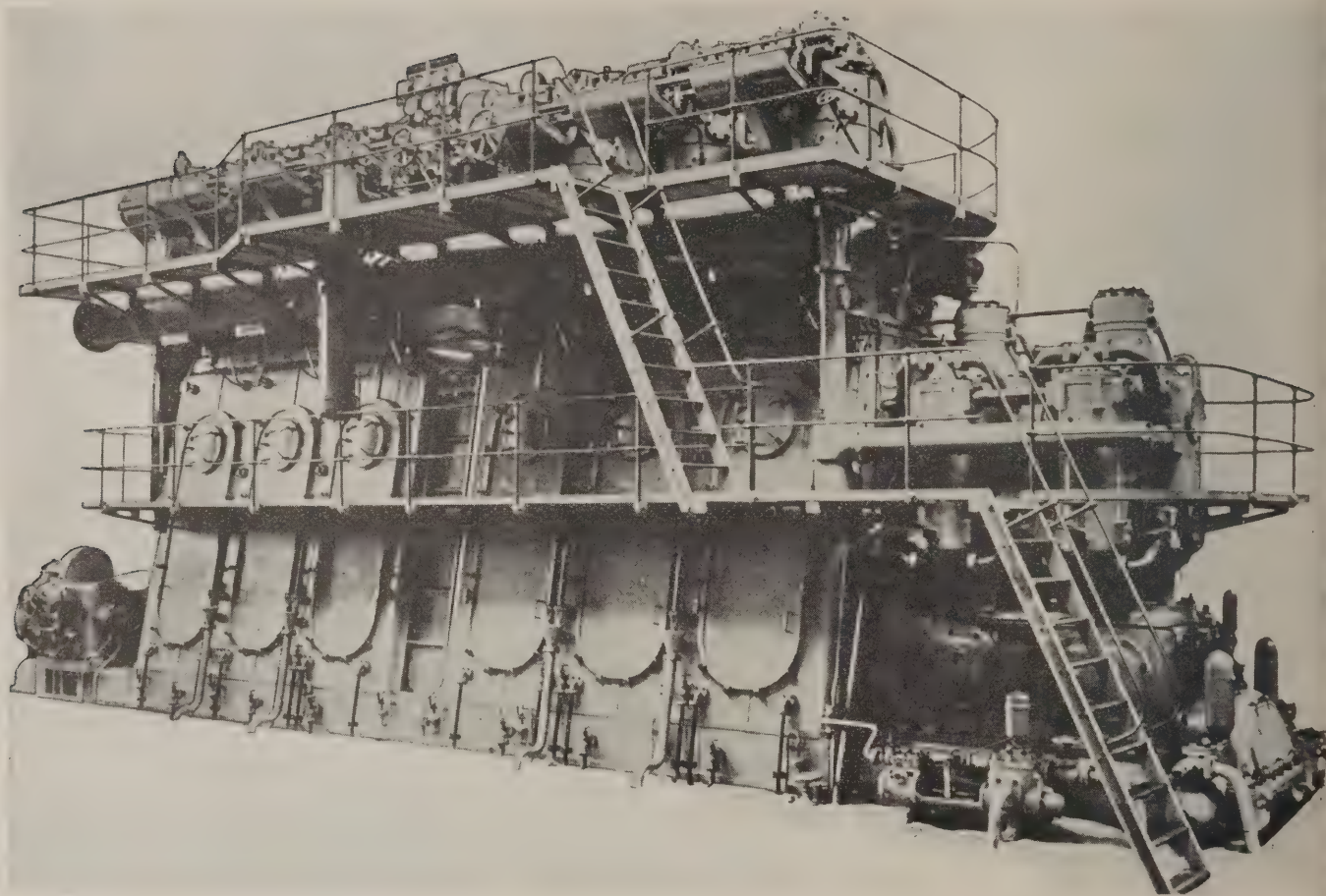
service. It should be added, however, that equally high piston speeds have been employed in submarine engines for some years past, so that the development is not entirely novel.

The cylinder cover at the top of the engine is more or less normal, with exhaust, inlet, air starting and fuel valves operated from long push rods from the camshaft in accordance with Burmeister and Wain single-acting practice. In the bottom cylinder cover, however, only three valves are located: The exhaust, inlet and starting air valves. There are two fuel valves, but these are arranged horizontally in a distance piece between the cylinder cover and cylinder. Through these, fuel is injected tangentially at points almost diametrically opposite, on account of the interference of the piston rod. It will be realized that the power developed at the bottom of the piston is not equal to that on the top, owing to the fact that the piston rod passes through the combustion chamber, and that the net effective cylinder diameter is correspondingly reduced.

Although the engines in the liner will be fitted for the ordinary system of fuel injection by compressed air, they will not drive their own air compressors. Separate Diesel driven units of 600 brake horsepower will be installed in the engine room for this purpose and in this way, a higher shaft horsepower will be developed for a given cylinder dimension than would otherwise have been possible. It is estimated that the consumption on each of the 7,000 brake horsepower motors will be in the neighborhood of 30 tons daily.

SINGLE-ACTING ENGINES FOR NEW GERMAN LINER

The highest powered Diesel engines built in Europe for installation in a ship have just been completed and have



One of Two 3,000 Brake Horsepower Sulzer Engines to Be Installed in the German Liner *Fulda*

been installed in the new 9,500-ton transatlantic passenger liner which the North German Lloyd is building for its service between Bremen and New York. These motors, of which an illustration is given, are of the Sulzer type and are normal two-cycle single-acting sets developing their power at 100 revolutions per minute. They have six cylinders, 680 millimeters bore with a stroke of 1,100 millimeters and it will be observed that although two injection air compressors are driven off the crankshaft, there is no scavenging pump. This is in accordance with the latest Sulzer practice. In the ship, the scavenging air will be provided by two rotary blowers, each driven by a 300 brake horsepower motor, running at about 2,750 to 3,000 revolutions per minute. The total power absorbed for supplying scavenging air to two propelling engines of 6,000 brake horsepower will, it is estimated, be under 250 brake horsepower.

In these engines, the scavenging air, at a pressure of 1.4 pounds per square inch is admitted as usual through two series of ports, the upper row giving a super-charge after the exhaust ports are closed. The starting air and fuel valves are arranged in one housing, so that only one hole has to be provided in the cylinder cover, and the valve gear, operated from an overhead camshaft, is comparatively simple. As the illustration shows, the control gear for the engine is arranged at the level of the top grating, a system that is now almost universally adopted in Sulzer engines. There is, however, a good deal of auxiliary machinery at the engine room floor level, and in case of necessity, the main engines must be capable of control when the engineer is below. A lever is therefore arranged which will enable the attendant to stop either of the propelling engines, if it is so desired, when he is at the bottom of the engine room.

The engine drives its own lubricating oil pumps and also an additional pump, supplying oil at a pressure of about

250 to 300 pounds per square inch to the crosshead bearing. This arises from the fact that the pressure on this bearing is not relieved during every revolution, as is the case with a four-cycle single-acting motor. The main cooling water pumps are separately driven, one being provided for the cylinder jackets, in which sea water is used, and another for piston cooling, fresh water being employed in this instance.

The trials on these engines appear to have given remarkably good results. The fuel consumption for the engine alone works out at about 0.395 pound per brake horsepower, while, if the power needed for driving the electrical auxiliaries be added, the total consumption varies between 0.41 and 0.42 pound per brake horsepower. The passenger liner in which the two engines will be installed, named the *Fulda*, is being built by the Weser Company at Bremen, and will have a cabin accommodation for about 870 people, the majority of the cabins being arranged for third class passengers.

Another passenger liner of 12,000 tons gross is being constructed in Germany by Blohm and Voss for the Hamburg South American Line and in this case also, twin screw machinery of between 6,000 and 7,000 brake horsepower is to be installed. The engines are, however, being constructed by Blohm and Voss, and will be of the normal four-cycle construction as developed by this firm in conjunction with the M. A. N. of Nürnberg.

ORIGIN OF FIRES ON BOARD SHIPS.—According to a recent notice given to shipowners and shipbuilders by the British Board of Trade, which analyzed 241 fires occurring during one year on British ships, 70 percent of the fires occurred in bunker spaces, 12.1 percent were due to oil fires including launches, and 17.9 percent were due to miscellaneous and other causes, including superstructure and engine room fires.

Tuning Up the Engine and Boiler Room—II

Written on Board the George Washington as a Good
Example of What Can Be Done with Existing Ships

By William L. Bunker*

THE air pumps are of various makes and types, the latest and best known being the vertical type pump fitted with a large brass plunger and a properly sized bronze cylinder. It is fitted with foot, bucket, and head valves. There is also the independent air pump, either of the duplex or simplex type, fitted in the same manner and the Edwards type which consists of a solid brass plunger with only one set of valves and is usually called the displacement type of air pump.

Air pumps should be examined periodically, either monthly or not exceeding 60 days, care being taken to see that packing in the plunger, which is usually flax and sometimes of brass rings, is in good condition. The valves which of recent years are of a close grain bronze, should be examined to see if they are cracked or warped, and that valve seats, gaskets, etc., are in good condition and not loose or unduly worn.

From the air pump the feed water is discharged into a hot well or very often a filter box. The latter is a tank with efficient compartments, one or more of which are filled with absorbent material to soak up any grease that is in the feed water. It then passes through to the feed pumps on its way to the boiler.

Feed water filters are usually constructed with several compartments or in duplicates so that one can be shut off while the other is being cleaned and the water passed through the other while this process is going on. Aloofa sponges, cocoa mats, excelsior and other material is used in these feed water filters and in plants where, on account of superheated steam or for other reasons, lubricating oil is fed inside the cylinders this absorbent material should be changed at least twice a day and in many instances every watch of four hours. When a longer time is allowed to elapse the object of a feed water filter is lost and the grease passes to the boilers.

FEED PUMPS

The feed pumps are usually in duplicate and large enough so that half of the installation can handle the feed water at full speed. Therefore, the overhauling of these pumps can be done at sea without a shutdown which would be necessary should all pumps let go at one time.

The feed pump, which is generally a vertical direct connected type, consists of a steam cylinder and a water cylinder. For purposes of economy, this pump is usually of the simplex type operated by an automatically controlled piston valve admitting steam to both ends of the cylinder. Care must be taken to keep this automatic steam valve, usually called the chest piston, and the walls of the cylinder parallel, otherwise this valve will stick, causing a stoppage of the pump. The valve gear attached to the crosshead of the pump and operating this valve must also be watched closely to see that undue wear does not take place.

The steam piston should be examined monthly to see that the rings are tight and the cylinder should also be examined to see that the walls are parallel and in good condition. The water end of the pump needs constant attention and should be overhauled at periods not exceeding one month or when the vessel stops at terminal port. The packing in the plungers is of various types; good results are obtained by the use of a long white-metal plunger with adequate water grooves,

providing the plunger is made long enough to reduce wear of the cylinder. Narrow rings of white metal should not be fitted in a plunger as many breakdowns of feed pumps have been so caused. Where the stroke of the pump does not permit a long, solid, white-metal plunger to be used, various packings of a fibrous nature can be fitted, the most common of which is called woodite or ebonite. This material gives good results for a feed water temperature up to and including 220 degrees Fahrenheit.

The valves in the water end of feed pumps should be set to a very restricted lift due to the pounding action which takes place when valves are allowed to lift too high. This hammering action wears the seat, breaks the valve and puts the pump out of commission in a short time.

FEED WATER HEATERS

After leaving the feed pump the water passes through the feed water heater on its way to the boiler. Although there are many kinds of feed water heaters there are two principal types, the open type and the closed type. The open or Weir type is where the exhaust steam from other auxiliaries is met and condensed by a spray formed by flowing feed water passing through jets or nozzles. The water absorbs the heat in the exhaust steam and falls by gravity to the feed pump. The open heaters must be located at a considerable height above the feed pump or excessive slamming will take place caused by the vacuum created by the piston of the feed pump liberating vapor from the hot water. The water should flow in solid mass to fill the space left by the retreating plunger. Unless great height is used for open heaters it is impossible to get the feed water above 200 degrees Fahrenheit.

The other type called the closed heater consists of a series of coils through which the feed water passes. The coils are contained in a tank-like structure into which the exhaust steam enters. When this steam comes in contact with the cooler coils heat is liberated from the steam and the condensation is drained back into the hot well. By the use of greater surfaces and higher back pressure the feed water can be brought to a very high temperature. From 220 degrees to 230 degrees Fahrenheit is very often the temperature of the feed water as it passes through the checks of the boilers. However, the bad feature of this is the back pressure and engineers should not allow this pressure to get higher than is necessary to conform with the best economical results. This can be done only by careful measurements and calibrations of the feed water. Engineers should remember that a saving of approximately 11 degrees in feed water means 1 percent saving in fuel.

After the feed water leaves the heater, pipes are very often left exposed to the atmosphere and lose by radiation the heat gained in the feed water heater. This should be corrected by heavy insulation on the feed water line.

MISCELLANEOUS PUMPS

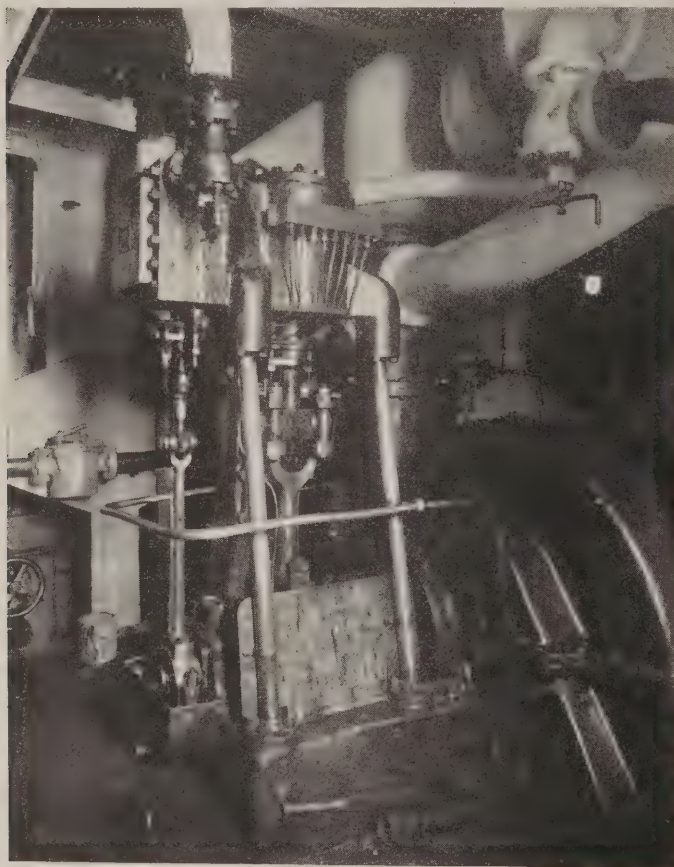
The pumps and pumping arrangements on board modern ships are of many kinds indeed and they vary from the heavy duty ballast pump to the small service pump used to send chilled water through passenger spaces for the convenience of those on board.

The ballast pump, which is usually connected by suction

*Superintending engineer, United States Lines.

pipes to all inner bottoms, bilge lines, etc., discharges overboard; however, it sometimes has an outlet to the main condensers so that it can be used in emergency cases to keep the ship moving at a reduced speed should any mishap occur to the circulating unit.

The items set down as governing the feed pump do not hold good in the case of the ballast pump which is always of an entirely different type, functioning under a low pressure system. The steam ends are of the usual type, but the pumps are generally of the duplex type and have the valve mechanism of one cylinder operated by the crosshead of the adjoining unit which is set at right angles. The valve gear then becomes of the positive type and less care is required to keep it in operating condition. Care should be taken, however, to



Reciprocating Engine Driving Centrifugal Circulating Pump

keep the link motion well fitted and in good condition so that the pump will not act in a jerky and faulty manner.

The water-end plungers are usually packed with a low grade material such as flax or other fibrous packing and the valves which are much larger than those of the feed type are usually made of rubber or some fibrous material. These pumps should undergo a periodical overhauling at intervals not exceeding 30 days.

SANITARY PUMP

The sanitary pump is usually of the same type as the ballast pump, namely, low pressure because the volume is used more for sanitary purposes than for pressure. The suction of this pump is always connected to the sea and discharges only into the sanitary system usually through a tank fitted on the superstructure allowing the head of water to flow through the accommodations on board the vessel. This pump should never have any other connections on account of obstruction to the fine mechanisms of flushometer valves, etc.

Where engineers find the suction of this pump connected to bilges, they should change this by blanking off this inlet,

thus using only clean water for the sanitary system. On some vessels that ply more or less in polluted waters, it is deemed essential to have filter tanks on the discharge side of the pump to remove all refuse from inlet water so that the delicate valves that are commonly fitted to flushometers and shower bath outlets in passenger accommodations will not be choked up. A pressure gage should be fitted to the filter so that the engineer can tell when filtering material needs changing.

FIRE PUMP

Fire pumps are usually of a heavier pattern than either ballast or sanitary pumps, for it is required that they maintain a pressure of at least 100 pounds per square inch for fire use on the upper decks of vessels. In order to obtain this head of water on the upper deck it often requires considerable more pressure than this at the pump. It is best practice to have this pump connected to the bilges, since it is often used for washing decks as well as for fire use. Dirty and greasy water from bilges pumped onto the decks of passenger ships sometimes leads to blows between the deck and engineering departments.

BILGE PUMP

Generally one or more pumps of adequate size are fitted for the use of bilges only. These pumps should be connected to other lines to be used in case of emergency. They are usually a combination type. All fittings on the water end of these pumps should be of composition metal to avoid corrosion.

FRESH WATER PUMPS

These pumps are of the usual low pressure type. Since they are used for fresh water only and as little corrosion takes place, they require the least amount of care.

EVAPORATORS

The law requires that an adequate evaporator and distilling plant be fitted to all vessels. They are especially essential on passenger ships. Evaporators of the coil type having a capacity of between 20 to 30 tons of water per day are usually installed aboard ship.

The manner in which evaporators function is simple in nature. Steam is taken in through coils which are partially submerged in sea water which causes the heated sea water to vaporize. This water vapor is taken either to a condenser to be used for feed water or passed into a distiller, which is nothing more than a small condenser where the distilled water is discharged through an aerator and through filter filled with animal charcoal and then discharged into the ship's drinking tanks.

The efficiency of an evaporator depends a great deal upon the amount of scale that is allowed to collect on the coils or evaporating surfaces. Many engineers use a system of filling the coils with cold water when they are hot in order to loosen this scale. This is done by blowing the evaporator entirely dry and refilling with cold water, thereby causing a sudden contraction of the heating coils which loosens the scale and allows it to break off and fall to the bottom.

This is a very bad practice and should be avoided because sudden contraction of the coils soon causes leaks in connections and fatigues the metal. The correct way to clean an evaporator is by the good old-fashioned system, that is, by opening the evaporator and removing the scale either by tapping the coils with a wooden mallet or by removing with a scraper of approved design. Safety valves should be fitted on evaporators allowing about 15 pounds per square inch shell pressure and care should be taken to keep these relief valves in good working order.

Little care is needed with the distillers except to keep the tubes tight so that salt water cannot mingle with the drinking water produced by the evaporator. Careful attention should be taken to see that the animal charcoal is kept

od condition and renewed at intervals of about six months, according to the amount of use the apparatus is put to.

GENERATING PLANT

Direct current of 110 volts on the two-wire system is the st practice aboard ships. The steam driven generators are her turbines direct connected, geared turbines or reciprocating engines. With either type the most important matter is keep the governor in good condition. Due to the uneven erating loads which are always placed upon electrical ants, it is necessary to have a positive and sensitive governor. In recent years, several engineers have been killed pile shutting down a turbine generator where the governor d become inoperative. Therefore, where high speed ared turbines are used, the engineer should see that he s a distant operating mechanism for shutting off the steam case of an accident.

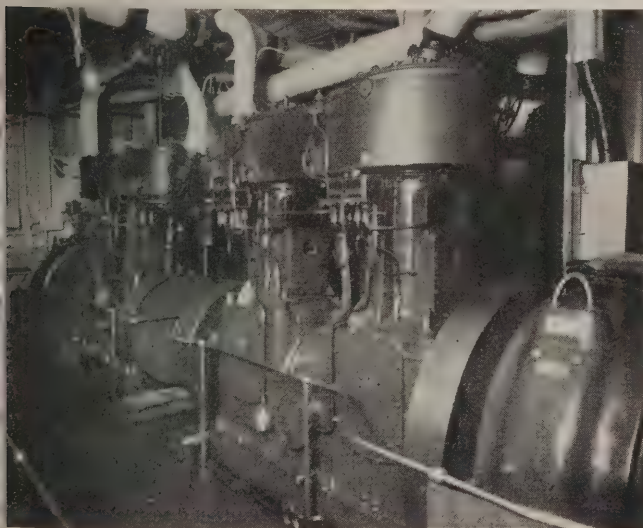
Little need be said about the reciprocating engine since is so well known and is usually reliable and fairly efficient. The only objection that can be raised to a reciprocating engine is a tendency to pump lubricating oil back through e feed water unless care is taken in keeping piston rods, and, etc., tight and in using the proper grade of oil in e dynamo.

REFRIGERATORS

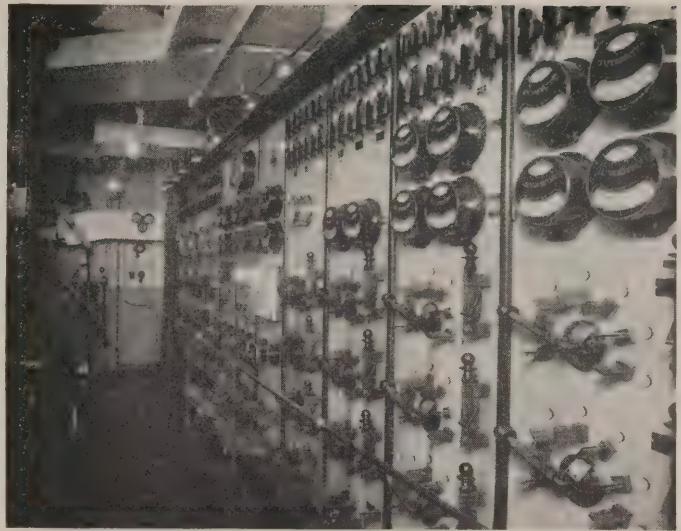
The refrigerating plants fitted to freight ships are usually the small ammonia type of from one to three ton capacities, according to the size of the vessel and the trade ute involved.

With passenger vessels, however, the refrigerating plant s become a very important item in the ship's equipment. e machines are generally either the ammonia type or the rbonic acid gas type using the indirect cooling system ich is circulated to absorb the heat in the brine system. his brine system is pumped in turn through coils placed in e refrigerating compartment which is ordinarily overhead. sorbing the heat in this compartment it is returned to e tank to be again chilled by the circulation and expansion e carbonic acid gas or ammonia. Carbonic acid gas is eferable to ammonia on account of the danger of escaping s through a ruptured pipe or fitting. If the escaping gas ammonia, it is liable to drive the engineers from the comrtment and also, where refrigerating plants are located tside of the engine room, to cause considerable inconvenience to passengers.

Little can be said relative to the economy of either synn, since both are highly efficient when used in a properly signed and constructed machine.



Two of Vessel's Equipment of Six Dynamos, Each Consisting of Compound Engine Driving Compound Wound Generator



Main Switchboard

With the ammonia plant it is necessary to maintain a much smaller clearance than with the CO₂ machine. In both cases the engineer must keep a vigilant and constant watch over all glands and connections to avoid the loss of gas. The grade of lubricating oil is also a great factor in the successful operation of either type of machine. The very highest grade of oil guaranteed by well known oil companies is none too good for the use of this apparatus. On each gas condenser a relief valve should be fitted and this valve proven to be in operating condition every week. Many condenser boxes are ruptured by the failure of this valve to work.

Sometimes the discharge valve from the condenser is closed by mistake or not opened when starting the machine and very often the discharge on the ship's side is stopped up by the vessel lying against a fender at the pier. The discharge is usually near the water line so that the overflow will not get into cargo lighters when the ship is light; this brings it close to or below water line when the vessel is loaded.

STEERING APPARATUS

Steering apparatus on board ship is very important and too much care cannot be taken to keep this machinery in the best possible condition. The steam tiller operated from the bridge by a hydraulic telemotor system is the usual type and nothing has been produced up to date which can compare to this apparatus. Many kinds of electrical systems and hydraulic gears have been installed only to be discarded and replaced by the steam apparatus.

In large ships where rudders are subject to heavy shocks from breaking seas, some means should be provided to absorb these blows either by some steam tiller apparatus such as the Brown steam tiller or by the use of heavy spiral springs and buffer rods as fitted by many well known shipbuilders.

The steam to the steering gear should be reduced in pressure through a reducing valve of some well known type, care being taken to have a by-pass fitted to pass the steam around this reducing valve in case it becomes inoperative.

On all vessels of a modern up-to-date steamship company the steering apparatus is tested out before the departure of the vessel in the presence of the chief officer, chief engineer and a representative of the shore staff. A form which states the apparatus is in good working condition is then filled out and signed by all concerned.

The greatest difference between the steering apparatus and other machinery on board the ship is the construction of the admission valve or, as it is sometimes called, the differential or follow-up valve. This valve keeps steam passing into the

engine until the operating wheel governing the telemotor is stopped, the apparatus then stays in that position until reversed or changed by the operating wheel in the pilot house.

The telemotor and differential gear should be thoroughly overhauled and inspected at every terminal port; the steering engine itself overhauled at intervals not to exceed 60 days.

ANCHOR WINDLASS

Windlasses are used to raise the ground tackle and when fitted with a gypsy head they are also used to warp the vessel to and from piers, etc. The engine for driving this apparatus is of the usual reciprocating steam engine type which operates a wildcat gear used for raising and lowering the anchors. The wildcats are fitted to the driving shaft and are so constructed that the links of the anchor cable chain engage with sprockets which deliver the chain into the chain locker. The wildcats are fitted loose on the shaft and are so constructed that the releasing gear can be used either to clutch the gear to the engine for lifting, or, by disengaging it, for lowering the anchor. The wildcat is fitted with a brake of heavy construction called the compressor-band which is operated to check the chain and hold the same when vessel is anchored.

On larger vessels riding clamps are fitted to the chain so that the strain can be taken off the wildcats when the vessel is riding at anchor. These riding clamps are usually operated by a right and left hand thread and when exposed to the weather should be well greased to avoid deterioration by rust.

While the windlass usually comes under the care of the carpenter, it will save the steamship company much money for repairs and also annoyance to all concerned, if the engineers take an interest and see that the windlass is well oiled, greased and kept repaired, remembering that a stitch in time saves nine.

WINCHES

When in operation in port the engine department should have one man detailed to see that all bearings on winches are oiled every half hour and that the piston rods and valve stems are swabbed well with cylinder oil at least once an hour.

It is found that main engine oil which is pumped out of crank pits and filtered often works well on winches, especially where some of the rape seed content is allowed to remain. This rape seed together with the water which works into the bearings forms a lather. Considerable saving can be made by using a heavy sticky grease for slushing the gears and this should be done several times during the day when winches are in operation. Heavy oil or grease should be applied to all rods and bright parts of winches when the vessel leaves port to keep sea and rain water from rusting or corroding the metal.

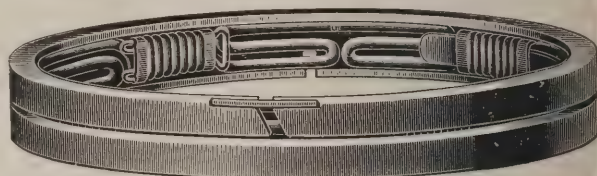
Heavy guards should be well fitted over gears and moving parts to avoid accidents to workmen and also to keep wire ropes and falls from getting between the gears, causing a breakdown. Steam pipes to winches should be covered and lagged with some of the new coatings such as thorkote which is impervious to water and makes a good insulation. Steam cylinders should not be lagged especially where a pocket is formed by the valve chest and cylinder coming together unless water-proof cement, as mentioned before, is used. The sheet iron lagging, when fitted, always leaks and the average insulation becomes soaked with water and acts more as a condenser than as an insulation, and also increases the corroding effect on the metal.

The latest style of fitting winches has proved very satisfactory, which is to place a winch several feet above the deck and when at sea the machine is covered with a heavy canvas which keeps off the rain and sea water. This system pays well by prolonging the life of the winch.

Kearfott Engineering Company Takes Over American Agency for Lockwood and Carlisle Piston Packing Rings and Springs

SO many American ships are fitted with Lockwood and Carlisle's patent piston packing rings and springs that the agency for the United States has been taken over by the Kearfott Engineering Company, of 95 Liberty Street, New York.

These springs, which are standard on most British lines are now used in increasing numbers. The spring is simple and efficient and is designed to have two distinct actions, one to press the packing rings outwards against the walls of the cylinder, and the other to make steam-tight joints on the piston and junk ring faces. The friction is reduced to a minimum so as just to ensure steam-tightness, and the side or vertical compression forms a steam-tight joint on piston



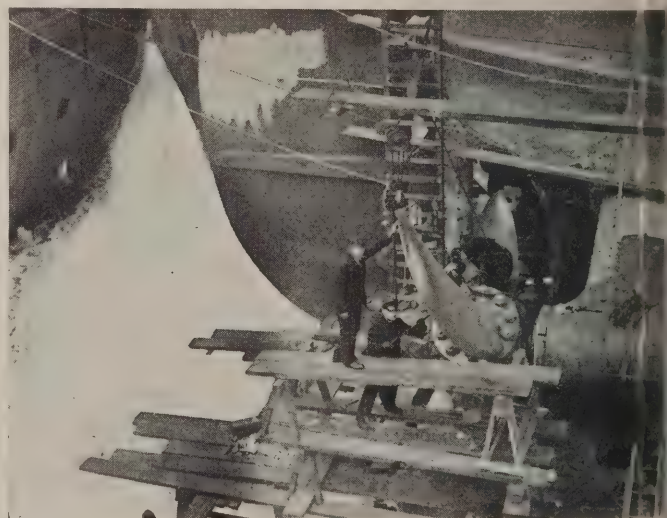
Piston Packing Ring

flanges. With these double-action springs thorough steam tightness is secured, it is claimed, with the least possible amount of friction. The packings are simply and easily adjusted when required.

For superheated steam the high pressure rings and springs have two flat uncut restraining rings, one on the top and one on the bottom, the whole forming a safeguard against excessive wear of superheated steam of high pressure.

A modification of the rings is made by Lockwood and Carlisle for piston valves. These rings and springs prevent the steam gaining access to the spring space at the back of the rings by means of a double-acting spring. This spring gives a strong vertical pressure which keeps the faces tight while the outward action, which is quite independent of the vertical, can be reduced to a minimum.

Rings and springs are made for every class of auxiliary steam engine, viz., steering, dynamo, pumps, refrigerating winches, etc.



© Keystone View Co., N. Y.

View Showing Propellers and Lower Stern Frame on Steamship George Washington in Dry Dock at Charlestown Navy Yard

Protective Coatings for Shipbuilding Purposes— Bituminous Compositions

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their use that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

WHERE a protective coating of the nature of a paint is desired but something more durably efficient than paint is needed, bituminous coatings are usually employed. Steel surfaces of coal bunkers, of double bottom water tanks under or near boilers, of refrigerated spaces and, in some cases, of the bilges are subject to excessive corrosion and are good subjects for the application of bituminous coatings.

These coatings may have an asphalt or a coal tar base; there are also somewhat similar coatings made from mineral rubber or Elaterite.

Bituminous coatings as deck coverings have been dealt with in the writer's article on that subject in the issues of his magazine for March and April, 1922. Bituminous coatings on ships' bottoms are of particular interest in connection with concrete ship construction and have been dealt with in the writer's article on "Cement and Concrete" in the June, 1922, issue of this magazine.

The coating consists of one or more coats of a solution applied directly to the clean, dry metal surface, upon which there is usually a final coat of enamel. The thickness of the enamel coat depends upon the severity of the service. The composition of the solution and enamel must be such that the covering will be firmly adherent, sufficiently elastic not to crack or break up, and of a softening point that will not allow it to flow or be indented by traffic at temperatures met with in the various places where it is used on shipboard. Specifications for these coatings adopted by the United States Shipping Board Emergency Fleet Corporation are a good guide to what is necessary to meet these requirements, and they are here copied.

SHIPPING BOARD SPECIFICATIONS FOR BITUMINOUS COATINGS

Bituminous Solution and Enamel:

Bituminous solution and enamel will be acceptable when made on an asphalt or a coal tar base.

Bituminous Solution (Asphalt):

This shall consist of an asphalt or combination of asphalts of same characteristics as that used in the asphalt enamel except that no mineral matter shall be added. It shall be thinned to satisfactory covering, brushing and working properties with mineral spirits. It shall dry at least to a tacky state within twenty-four hours so as to provide satisfactory bond between metal and enamel coating. This bituminous solution shall not flash below 40 degrees C. by the open cup method.

Bituminous Enamel (Asphalt):

(a) This shall be composed of a high grade water-rejecting asphalt or combination of asphalts containing not over 20 percent of Portland cement and added lime compound. (See later—H. H. T.) It shall show the following physical and chemical characteristics:

(b) Penetration at 25 degrees C. not more than 15 nor less than 5. (Standard A. S. T. M. method.)

Ductility at 25 degrees C. not less than 1 centimeter. (Method A. S. T. M. Committee Reports 1915, page 349.)

Loss at 163 degrees C. for 5 hours on 20 gram sample not more than 0.5 percent.

(c) Melting point (ring and ball method) not less than 80 degrees C. (176 degrees F.). Total ash not more than 30 percent.

(d) When the solution and enamel are applied in the manner of their use to a test metal panel, the coatings must be unaffected when maintained at a temperature of 65 degrees C. in a vertical position for 2 hours to the extent of not becoming tacky, running or sagging from the vertical surface.

(e) When solution and enamel are applied in the manner of their use to a steel panel at least 18 inches square and not less than $\frac{3}{8}$ -inch thick, the coating shall stand the blow of a steel ball weighing 700 grams dropped from a height of 180 centimeters without flaking from the plate except beneath the point of impact and no radial cracks shall develop longer than 5 centimeters from center of point of impact. During this test the steel plate shall be supported in a horizontal position and support shall be placed beneath the point of impact. This test shall be made at a temperature between 25 degrees and 30 degrees C.

4. Bituminous Solution (Coal Tar):

This shall consist of a coal tar pitch of the same characteristics as used in the coal tar enamel, except that no mineral matter shall be added. It shall be thinned to satisfactory covering, working and brushing properties with a coal tar distillate. It shall dry to at least a tacky state within twenty-four hours so as to provide satisfactory bond between metal and enamel coating. This bituminous solution shall not flash below 40 degrees C. by the open cup method.

5. Bituminous Enamel (Coal Tar):

(a) This shall be made from coal tar pitch free from water, gas or oil tar pitch and be well mixed with finely powdered mineral filler not in excess of 20 percent. It shall show the following characteristics:

Loss at 163 degrees C. for 5 hours on 20 gram sample not more than 3 percent.

Melting point (cube method) in water or glycerine bath not less than 80 degrees C. (176 degrees F.).

Total ash not to exceed 20 percent.

Free carbon not less than 15 percent nor more than 30 percent.

(b) When solution and enamel are applied in the manner of their use to a test metal panel, the coating must be unaffected when maintained at a temperature of 65 degrees C. in a vertical position for 2 hours, to the extent of not being tacky, running or sagging from the metal surface.

(c) When solution and enamel are applied in the manner of their use to a steel panel at least 18 inches square and not less than $\frac{3}{8}$ inch thick, the coating shall stand the blow of a steel ball weighing 750 grams dropped from a height of 180 centimeters without flaking from the plate except beneath the point of impact, and no radial cracks shall develop longer than 5 centimeters from center of point of impact. During this test the steel plate shall be supported in a horizontal position and support shall be placed beneath the point of impact. This test shall be made at a temperature between 25 degrees and 30 degrees C.

In 3 (a) of the above specifications there is the statement that the asphalt enamel shall contain not over 20 percent of Portland cement and added lime compound. The United States Bureau of Standards has stated regarding this that according to its experience any finely ground inert mineral filler, such as finely ground clay, is satisfactory for the preparation of bituminous enamels for the inside of the hulls of steel vessels; but that slaked lime should not be used, as its effect upon bituminous materials is questionable and serious defects probably due to it have resulted in similar mix-

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

tures produced for other purposes. It will be noted from the melting point that the enamel has to be applied hot.

As with other compounds dealt with in these articles, the test of actual service is important, and there are a number of proprietary makes of bituminous coatings which have proved satisfactory. The Bureau of Construction and Repair of the Navy Department has a dozen or more of them on its approved list.

A compound made from Elaterite or mineral rubber named Elaterite 45-A has given good results as a protective coating for iron and steel. It makes a strong bond with the steel and is applied cold. In the ease of its application it has a decided advantage over bituminous enamels. It has received classification society approval as a substitute for bituminous solution and enamel. The manufacturers definitely state, however, that for comparative results when used for this purpose not less than four coats should be applied and preferably five coats.

Some other coatings that are applied cold with heavy dauber brushes, compounds of asphaltum, oils and fillers, have given good results; but they cannot be expected to equal bituminous enamels. When using them no priming coat is required, it is unnecessary to remove oils and greases and even a little dirt on the surfaces is not a serious matter.

Navy Department requirements as to the use and method of application of bituminous compositions as given in the 1918 edition of the General Instructions for Painting and Cementing Vessels of the United States Navy are in the main as follows:

The following spaces on all vessels (except over galvanized plating of destroyers or on vessels of special light construction) shall be coated with an approved bituminous solution and cement or enamel: Trimming tanks, drainage tanks, reserve feed-water tanks, ship's fresh-water tanks, gravity tanks, sand lockers, top of inner bottom in engine and boiler rooms, dynamo and dynamo condenser rooms, also the inner surface (including stiffeners, etc.) of bulkheads surrounding the engine and boiler rooms to the height of the floor plates, and all foundations, etc., in these spaces to the same height; connecting passages between machinery spaces, shaft alleys, all closed spaces in foundations, girders and pockets that are inaccessible after completion and at junction of an inclined deck and ship's side; also the inner surface of bulkheads surrounding the dynamo condenser rooms to a height of about 2 feet above the inner bottom and foundation in these spaces to the same height; also interior of battery-charging station. Coal bunkers and chain lockers shall be coated with two coats of bituminous solution of the approved list contained in the Bureau files. Special attention shall be given to the thorough protection of portions of the machinery spaces which may become difficult of access upon completion. The foregoing shall not substitute bituminous compositions for spaces required hereinafter to be coated or filled with asphalt cement (formula No. 60).

Fresh-water tanks coated with bituminous solution and enamel shall be thoroughly washed out three times before the delivery of the vessel to the Government. In each case they shall be filled with fresh water, allowed to stand not less than six days before being emptied, and the tanks washed. The last washing shall take place not more than thirty days before the delivery of the vessel to the Government.

APPLICATION: Metal shall be free from paint and thoroughly clean, and, at times of application of any protective coating, surfaces shall be thoroughly dry. One coat of the bituminous solution shall be applied and be well spread out with a brush. This preliminary coating, necessary with either the enamel or the cement, shall be followed, after drying or at least becoming tacky, by a coat of cement or enamel applied hot; the cement being suitable for flat horizontal surface is poured on hot and spread rapidly with a brush or by some equally efficient means to a minimum thickness of one-fourth inch. The enamel which is applied hot is suitable for overhead and vertical or inclined surfaces where the cement can not be used, and shall be applied to a minimum thickness of one-sixteenth inch. Bulkhead bounding angles, boiler foundations, and other metal work projecting through the cement shall have the bituminous cement poured along the lower edge in order to completely coat the angle.

Artificial ventilation shall be furnished while any bituminous coating is being applied.

The asphalt cement referred to in the foregoing excerpts is the composition given under that heading in the writer's article on "Cement and Concrete" in the July, 1922, issue.

It will be noted that double-bottom tank tops in the engine and boiler rooms are among the items required to be coated with bituminous solution and enamel. This procedure as far as the boiler room is concerned is seriously objected to by some of the large operators, marine engineers and others, as far as oil burning vessels are concerned. In some cases Portland cement or Roman cement is substituted (see the July, 1922, issue of this magazine). The claims are made that, if fuel oil on the fire room tank top catches fire, the bituminous coating on the steel work also catches fire and tends to spread the flames; that the bituminous coating absorbs spilled oil and gives off vapors for a long time afterwards, thus adding to the resultant discomfort and increasing the danger on this account as well as on account of becoming saturated with oil; and that the fuel oil disintegrates the bituminous coating and causes it to flow. The last claim is also made for lubricating oil acting upon a bituminous tank top coating in the engine room. Regardless of what merit there may be in these arguments, it is questionable, if bituminous coatings are usually necessary for the protection of boiler room tank tops where oil is used as fuel. It may be of interest in this connection to state that oil tanker specifications submitted by shipbuilders as a basis for contract specifications to the United States Shipping Board Emergency Fleet Corporation, in accordance with pre-war construction and with the customary oil fired boilers, called for bituminous coatings on the engine and boiler room tank tops with but one exception. In this exception these coatings were required on the engine room tank top but not on the boiler room tank top.

The author considers that the following specifications typify good practice in the use of bituminous coatings:

1. Engine room tank top, one coat of solution and one coat of enamel $\frac{1}{4}$ -inch thick.
2. Boiler room tank top, of coal burning vessels, one coat of solution and one coat of enamel $\frac{1}{4}$ -inch thick.
3. Engine room bilges to 6 inches above the working platform, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.
4. Boiler room bilges to 6 inches above the working platform, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.
5. Tank top in shaft tunnel, one coat of solution and one coat of enamel $\frac{1}{4}$ -inch thick.
6. Inside surfaces of shaft tunnel and recesses at forward and after ends to 6 inches above the working platform, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.
7. Inside surfaces of hold and 'tween deck coal bunkers where oil is not to be carried, two coats of solution on the under side of the decks, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick on interior surfaces, and one coat of solution and one coat of enamel $\frac{1}{4}$ -inch thick on shell surfaces.
8. Interior of chain locker, two coats of solution on the under side of any deck or flat, and one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick on all other surfaces except the bottom. One coat of solution and asphalt cement on the bottom.
9. Interior of refrigerating room, two coats of solution on the under side of the deck, and one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick on all other surfaces.
10. Interior surfaces of double bottom tanks in way of engine and boiler rooms, where oil is not to be carried, from the aft engine room bulkhead to about 6 feet forward of the forward boiler room bulkhead, two coats of solution on the under side of the tank top, and one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick on all other surfaces.
11. Interior of double bottom pump wells and cofferdams, two coats of solution on the under side of the tank top, and one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick on all other surfaces.
12. Floors and keelsons of single bottom vessels in way of boilers, where not filled in with cement, one coat of solution and one coat of enamel $\frac{1}{4}$ -inch thick.
13. Bulkheads in the engine and boiler rooms to one foot above the working platform, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.
14. Steel decks under composition deck covering, two coats of solution.
15. Bilges in cargo holds to the height of tank side brackets, one coat of solution and one coat of enamel $\frac{1}{4}$ -inch thick.
16. Engine, boiler and auxiliary machinery seatings to the height of the working platforms, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.
17. Surfaces of shell, floor plates, etc., in shaft spectacles of twin

screw ships, where not filled in with cement, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.

Additional items for which the expense of bituminous coatings is sometimes warranted are:

18. All interior surfaces of fore and after peak tanks, where not filled in with cement and where oil is not to be carried, two coats of solution on the under side of any deck or flat, one coat of solution and one coat of enamel $\frac{1}{4}$ -inch thick on the shell for a height of about 5 feet, and one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick on all other surfaces.

19. Boiler room tank tops of oil burning vessels, two coats of solution.

20. All bulkheads for the distance of 18 inches up from the tank top, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.

21. Deck in way of the ice machine, and ice machine seatings, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.

22. Winch seatings and deck in way of same, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.

23. Steering engine seating and deck in way of same, one coat of solution and one coat of enamel $\frac{1}{8}$ -inch thick.

It will be noted that double bottom tank tops in holds are not referred to in the foregoing requirements. It is customary to have wood ceiling on these tank tops, and a very effective and inexpensive coating is obtained by a thick brush coat of liquid tar, using old brooms, and dusting this

with sufficient Portland cement powder to get a white surface. The tar absorbs the cement and the black color comes to the surface in a short time, but the coating does not flow.

It might be asked why no enamel is recommended for the under side of the tank top in items 10 and 11, and the under side of other flat surfaces. This is because in such locations two coats of solution, properly applied, should be sufficient, and because the hot enamel is difficult to apply on overhead surfaces and particularly difficult in confined spaces like a double bottom.

The value of carrying the bituminous coatings in the double bottom several frame spaces forward of the boiler room bulkhead was brought home to the writer as a result of examinations of double bottom tanks made in connection with damage from grounding. In several cases the carefully protected tanks under the boilers were found to be in good condition while the steel work in the after two or three frame spaces of the tank next forward of the boiler room, upon which the usual Portland cement wash coating had been applied, was found to be badly corroded. The balance of the tank in every case was in good condition, being apparently beyond the range of destructive action due to the heat from the boilers.

British Shipping and Shipbuilding Developments

Indications Against Revival in Shipbuilding—Motorship May Be Exception—Obsolete Tonnage a Menace—Scrapping Plan Needed

By W. H. Wendon

JUDGING from the order books of the principal shipbuilders, the shipowners of the United Kingdom, after their recent little flutter in regard to the placing of contracts for new vessels, would appear to have decided almost unanimously that there must be a breathing space before further contracts for tonnage are awarded. What little demand there was for cargo steamers has, in fact, practically ceased. So far as passenger vessels are concerned, shipowners maintain that, inasmuch as building costs are, in their opinion, too high, it is idle to discuss new contracts, especially as the existing tonnage is capable of coping with the present traffic.

On the other hand, there are numerous inquiries for cargo vessels fitted with Diesels, and some of the proposals which are being made have features which are not unattractive. A Diesel-engined cargo boat, carrying 9,000 to 10,000 tons deadweight, could be built, it is computed, for about £14 per ton, smaller ships necessarily costing more per ton, and on this basis, for vessels of the type indicated, it is felt in usually well-informed circles that such boats appear to be a possibility of the not distant future which owners will be unable safely to ignore.

The factors which are inducing owners to refrain from entering into fresh tonnage commitments are worthy of closer study. Take, as a case in point, the attitude of Messrs. Alfred Holt & Company, the managers of the Blue Funnel Line. Messrs. Holt have now had delivered to them the *Dardanus*, a vessel of 10,000 tons deadweight and 15 knots speed, and, for the time being, the last Blue Funnel liner under construction. Messrs. Holt confess, with not uncommendable courage, that like all, or nearly all, other shipping people, they made the radical mistake of thinking that trade would be more prosperous and more progressive after the war. The result is that they entered into commitments which exceeded their power to fulfill conveniently, but having fulfilled these contracts they find themselves unable, as I have

indicated, to give a further order, at all events for the present.

EXPECTED ABOLISHMENT OF EXCESS PROFITS TAX

The fact is, as all who have followed the subject will agree, that many British shipowners considered that, at the beginning of 1920, when freight rates were at their peak, the excess profits duty would be abolished, and that such profits would accrue as would permit of expensive new or second-hand tonnage being paid for without placing the shipowners in a dangerous financial position. But the increase of the tax from 40 percent to 60 percent dashed to the ground the hopes of the shipowners; the slump ensued, and so it happens that many owners, even at this distant time, are still hard pressed to carry out the new tonnage commitments into which they so light-heartedly entered.

The experience of Messrs. Holt & Company with the *Dardanus* is typical of what has taken place with so many other vessels. The building cost was admittedly high, but due to circumstances over which the builders had no control. The steel was purchased at a very high figure, and labor costs at the time the contract was placed were heavy. Work on the vessel had to be suspended, and during the suspension the expenses of keeping the ship in order ran on. Appreciable reductions in shipbuilding costs have been effected, but the view is unanimously held that they will remain high above the pre-war level. Unskilled men in many cases receive the same rates as—in some cases higher rates than—skilled workers, a condition which obviously should not be.

GOVERNMENT REGULATIONS INCREASE BURDEN

Shipbuilders, too, are fettered by government regulations which, in years gone by, were non-existent. Delays and increases of cost are caused by the obligation to adapt plans of ships to Board of Trade rules, and especially to comply with the requirements of the International Convention. In

at least one respect, therefore, shipbuilders are not to blame if costs are too high. Tramp steamers can, it is said, be built at 50 percent over pre-war prices, but one well-known shipbuilder gives it as his considered opinion that passenger vessels could not be constructed at such figures.

The trying time through which the shipping and allied industries are struggling to emerge is exemplified in the North Country view that, as regards new orders for ships to be built or the sale of ships that were building, the past year has been by far the worst period that any living shipbuilder can remember. Practically no new orders were given by shipowners until the closing weeks of the year; on most of those partly built work was suspended, and when ships had to be sold the prices obtainable were only about one-third of what would have been readily secured in 1919-20.

For the remainder of the current year, the Newcastle Chamber of Commerce considers that it is doubtful whether any shipbuilders or marine engineers can avoid showing a considerable loss unless they draw on their reserves. If activity in shipbuilding is to be maintained, the chamber holds that either prices must be increased or the costs of building must be further reduced.

THE MENACE OF OBSOLETE TONNAGE

The question: To scrap or not to scrap? continues to exercise the minds of all connected with shipping, and not least those of the shipowners themselves. There is as yet, however, no sign of a fixed policy, or anything approaching thereto. It is generally agreed that the mass of obsolete and inefficient tonnage which, in its present condition, can never be operated at a profit, will continue to menace the market.

One of the best known British shipowners stated quite recently that, in his opinion, the sooner all non-commercial American ships and old British vessels are broken up, the better it will be for the shipping trade of all nations. But, however good this famous shipowner's intentions may be, it is out of the question to avoid the personal issue, as may be gaged from the fact that, while this shipowner advocates "scrapping," one of the companies under his control has just disposed of a steamer, not for breaking up, but for operating, and to foreign buyers at that.

SCRAPPING AGREEMENT NEEDED

When it is analyzed, however, there is nothing unnatural about the transaction, or the many others which might be cited. There is no possible chance of a scrapping program succeeding while it is confined to individual action. If the shipowner referred to had sold the vessel for breaking up, he would have realized probably about half the sum that was actually netted, and while, in the former case, he would have been acting in the best interests of shipowners generally, in that the vessel would be taken off the world's markets, his own company would have suffered to no small extent. Obviously shipowners cannot, as individuals, face their shareholders with the intimation that vessels owned by the company have been sold for breaking up at reduced prices in order that the international market might benefit.

The question of scrapping obsolete or semi-obsolete merchant ships, while not "as old as the hills," is certainly not a new one. The topic has come up for discussion whenever a depression, great or small, has appeared on the shipping horizon. But it has never been found possible to devise such an arrangement that an owner who, in the common cause, has disposed of his vessel to shipbreakers will be compensated for his loss out of a common fund.

HERR BALLIN'S PLAN

The most authoritative and oft-quoted view on this important subject is that of the late and great German shipowner, Herr Albert Ballin, whose tragic demise some few

years ago is still fresh in memory. Herr Ballin's "warning," as it was termed at the time, was penned in the closing days of 1911. The scheme suggested by Herr Ballin, to make provision during a time of prosperity for dealing with the inevitable future time of adversity, instead of waiting until the actual pressure of those harder times became burdensome, was that the owners of the large passenger lines should get rid of passenger vessels that had outlived their day, from the travelers' point of view, and should, in the public interest, cease to be in service.

A British shipowner, the late Mr. Welsford, advocated a more ambitious scheme for the temporary withdrawal from service of surplus tonnage when the world's carrying requirements fell below the capabilities of the available tonnage provided, so that, at least, barely living freights might be maintained instead of steamers being run at almost universal loss.

INSURANCE COMPENSATION

Herr Ballin believed that it might be possible, through some scheme of insurance, mutual or otherwise, to provide that steamers reaching a certain age—he suggested 20 years—and that had paid a very small insurance premium on their original cost regularly during their lifetime—which premiums would have accumulated at compound interest—should, on attaining the agreed age, be considered as having performed their life-work and be put on the scrap-heap, the owners receiving a price—say, 20 or 25 percent of their original cost—in consideration of the ships being broken up.

If at an earlier date they had met with misfortune, or had been sold to foreign owners, Herr Ballin planned that the premiums paid on them would, of course, be forfeited, and, therefore, the insurance company, or society, could accept lower premiums than would otherwise be necessary. He suggested that some of the leading British insurance companies, possessed of large capital, should quote what they would undertake it for.

Herr Ballin agreed that all these projects were more or less crude, and would require consideration and careful working out. His sole purpose was to call attention to the bad times which would inevitably follow the then good times, and to suggest that it would be wisdom on the part of shipowners, both British and German, to make arrangements which would mollify the hardships that were bound to come. Much has happened since his suggestions were outlined and the Great War has ruled out Germany as a main factor in any scheme which might be planned, but, among all the great maritime powers, there is apparently none which can evolve a really workable program.

SAFETY OF LIFE AT SEA

The recommendations just announced by the Merchant Shipping Advisory Committee with regard to life-saving appliances, training and organization on foreign-going passenger steamships will, it is hoped, help to solve some of the many knotty problems bound up with the general question of safety of life at sea. The committee is representative of all the principal shipping interests—shipowners, officers and men, pilots, shipbuilders, naval architects and underwriters—and has as its chairman a leading shipping light—Sir Norman Hill, the secretary of the Liverpool Steamship Owners' Association.

In addition to the committee men referred to, there are two members of Parliament, whose aim on the committee is to study the welfare of the traveling public. It is noteworthy that the report which the committee has issued, through the Board of Trade, is unanimous, and the recommendations contained in the report may be summarized thus:

1. Boats for all on board should be carried as far as is possible without encumbering the decks and impeding the prompt handling of lifeboats or the marshalling of the passengers. The committee observe that this is practicable in the great majority of existing foreign-going passenger steamships.

2. Where lifeboats for all cannot be provided without encumbering the decks and hampering the use of the boats already on board, the deficiency of accommodation for all on board should be met by means of light, buoyant apparatus.
3. In any case, however, over and above accommodation for all on board, light, buoyant apparatus should be provided for 25 percent of the persons on board for use in emergencies when it is not possible to launch all the boats.
4. Motor lifeboats fitted with wireless telegraphy should be carried in certain cases.
5. Illumination of the lifeboats in launching and immediately after being launched should be provided.
6. Boat drill stations to be established at the principal ports.

EXCEPTION TO HAGUE RULES RECOMMENDED

Progress has been made in the matter of the Carriage of Goods by Sea Bill, the measure planned to give force to the well-known "Hague Rules," but there are still important points outstanding. One of these points is in regard to coal, coke and patent fuel cargoes, which the British Coal Exporters' Federation consider should be excluded from the scope of the bill. The contention of the federation is that, while they appreciate the benefit which the rules would be to those traders who ship parcels of goods by liners under a

bill of lading alone, coal exporters for 25 years, together with the shipowners and coal importers, have negotiated agreed charter-parties and suitable bills of lading, and, when amendments were necessary, a conference of the parties was duly convened.

The members of the federation feel keenly that the bill would put the coal exporters in an unsatisfactory position as compared with that under the system of voluntary agreements. So strong, in fact, is their conviction on this point that they have put their case before the Lord Chancellor, who has promised to give the whole matter his careful consideration.

The rules incorporated in the bill, however, represent an agreement reached between the shipowners, manufacturers and merchants, not only in Great Britain, but abroad, and, in fulfillment of their promise to hold by the rules as they now stand, shipowners readily support the bill. They realize that in many respects material amendments might be desired in the bill and in the rules, but they recognize that any alteration in the latter would jeopardize the prospects of securing international uniformity, and that the bill incorporating them gives substantial effect to the bargain made.

Recent Developments in Marine Insurance

Flat Rates—Fuel Oil Hazards—Constructive Total Loss—Adjustments at Destination—Under-Deck Stowage—Right of Abandonment

By "Bordereaux"

SHIPOWNERS show poor judgment when they insure their old and new vessels at a flat rate. In a recent illustration of this method the owner had one old vessel and several modern ones. He asked and received a flat rate for all. In a short time after, the old steamer was lost, prior to the policy becoming operative. The result was that the new contract for insurance became effective on the new steamers only, with the age of the old steamer influencing the entire coverage. The better method is to insure each vessel on its own basis; the new ships have the advantage of a better rate and the cost of the coverage as a whole works out more scientifically and generally to the advantage of the owner.

Oil As Fuel

BY now the shipping trade is pretty well sold on the use of oil as a fuel. This is evidenced in the rapidity with which coal is being displaced and the Diesel engine coming into its own. But from the standpoint of the underwriter doubt still exists as to the comparative hazards surrounding coal and oil. He has become familiar with bunker fires, the shifting of bunker coal, cargo damage from coal dust, etc., and he has protected himself against their consequences by the use of controlling clauses. He recognizes the advantages of oil, but he views with pardonable anxiety the next set of problems involved.

Tank types for carrying the oil reserve are bothering him. They have to be not only oil-tight at the beginning of the voyage, but they must remain so en route under stress of all kinds of weather. It was at first found convenient to use the double bottom tank, and likewise the fore and after peak tank. Experience soon showed that the double bottom tanks when partially emptied on a voyage had a serious effect upon the stability of the vessel, and also that it was unwise to permit the oil to flow from one side of the vessel to the other. Accordingly, bulkheads were recommended which would so

divide the tanks as to prevent this development. It was also found that in transferring fuel from the peak tanks great care had to be exercised in making the transfer lines tight, as serious damage frequently resulted from leaky or broken transfer pipes. The number of cargo damage cases, through failure to make the tanks tight, has been legion. In one instance, for example, the manhole cover was left off the fore peak tank, and the oil flowed from the tank into hold No. 1 damaging a large quantity of flour.

These sources of danger, however, are insignificant compared with that of the great outstanding hazard of fire. An oil fire cannot be handled along the same lines as an ordinary fire. Oil tanks have frequently exploded because of fire and the inadequate methods employed to combat it. Careful data are being kept of disasters resulting from the use of oil fuel, not only by the syndicates but by individual underwriters as well. Froth, steam, and numerous fire extinguishing apparatus are provided by vessel owners, and inventive minds are constantly at work to supply new and improved safeguards. It remains, however, a question of considerable doubt as to whether cargoes which absorb odors easily can be safely carried by oil burners, with the smell of oil permeating the holds.

Constructive Total Loss

SOME interesting views by English judicial authorities were recently brought out in a case of alleged constructive total loss. In this instance the policy covered a cargo of coal en route from New York to Sevastapol, and the question of the liability of the underwriters was raised. In the course of the voyage a change of destination was made, without having been initialled by the underwriters; the coal being discharged and sold at Constantinople. A claim for constructive total loss was based on the fact that the cargo never reached its destination, and the adventure was not completed. It was held by the court that when

goods have to be discharged, reconditioned, reloaded and carried on to the port of destination, and it is discovered that the cost of these operations exceeds the probable value of the goods at the port of destination, there is a constructive total loss. Also that there is a constructive total loss when it is clear that as a matter of business it is quite impracticable to send the cargo on to its ultimate destination. The judgment of the presiding Justice was that the adventure in this instance was put to an end by the heating of the cargo in the hold of the vessel as she lay at Constantinople, and that it was impracticable from a business point of view, and commercially impossible, to send the coal forward; and that the loss was the result of the fire. Judgment was given for the plaintiffs.

Average Adjustments at Destination

OUR readers will recall the discussion conducted in this department in recent issues with respect to the advantages and disadvantages of having general average adjustments made at ports of destination, as was the usual practice prior to the World War. This important question was taken up and thoroughly gone over at the recent meeting of the International Chamber of Commerce at Rome. At that time the American delegates presented the attitude of their underwriting countrymen, which was in opposition to any change in the present method, the argument being that too generally there is apt to be a lack of competent adjusters and of established laws and usages as respects general average at ports of destination. However, the final attitude of the International Chamber was reflected in a resolution, given below, favoring a return to the pre-war practice. M. de Roussiers, representing French shipowners' interests, suggested that parties should be allowed to provide such other mode of adjustment as they thought fit, and that there should be an admission of freedom of contract to vary the rule. This position was opposed by the British delegates, and the French suggestion was tabled. The text of the resolution, as finally adopted, was as follows:

"The settled practice as regards general average, with certain recognized exceptions, is that unless the bills of lading or charter-parties stipulate for York-Antwerp Rules, 1890, or otherwise, it will be adjusted in accordance with the laws of the port of destination, if the voyage is completed, and, if not, then laws of the place where ship and cargo part company.

"With regard to the place of adjustment, it has been the general practice, with certain exceptions, referred to later, that if at the port of destination there are established laws and usages as well as competent adjusters the adjustment is prepared there.

"In certain trades, however, when a voyage extends to ports in various countries, and/or when the insurance is placed and guarantees taken at the home port, it has been found in practice desirable to have the adjustment prepared there.

"The effort in recent years to extend this practice by stipulating in bills of lading or charter-parties for adjustment at specially named places, such as London or New York, irrespective of trade or destination, is undesirable and frequently involves delay and extra cost in adjustment.

"The Congress, therefore, strongly recommend that the practice existing before the war in these matters should be maintained."

Right of Abandonment

COURT action has been recently had in a very unusual case involving the clause refusing the right of abandonment. This clause is exceedingly rare, and in the event of a serious casualty being sustained it is bound to lead to dispute. In this particular instance the American Merchant Marine Company was sued by the Liberty Sand and Gravel Company, Inc., in connection with insurance of a dredger in New York and Long Island Sound. The dredger sank, and the underwriters contended that this resulted from unseaworthiness, which was excluded from the policy. The latter contract contained a clause reading: "The insured shall not have the right to abandon the ves-

sel." Abandonment was, however, tendered and refused. Thereafter, it appears, the insurance company raised the wreck and placed her in drydock, and had her surveyed with the idea of repairing her. But they were charged with the duty of returning her without making any repairs or otherwise meeting liability. It would seem as though the plan at this point was to hold the underwriters to a total loss. The dredger was then bored with holes which were plugged, and she was removed from the drydock, floated to the place where she had been raised, the plugs taken out, and the vessel sunk.

The judge of the lower court held that this extraordinary action amounted to acceptance of abandonment on the part of the underwriters, and the court of appeals sustained the decision. The latter court, however, decided against the dredger company on the point of sue and labor, holding that the insurance company was not liable to contribute to the expenses incurred by the assured. The dispute evidently grew out of the "right to abandonment" clause.

Under-Deck Stowage

IN a recent decision, Judge John H. Partridge, of the Federal Court at San Francisco, has added the weight of his opinion to the familiar judgment that goods must be stowed under deck if a bill of lading is to be classed as "clean." The steamer *Fairhaven*, which stranded off Mazatlan, December 6, 1921, carried a number of cases of potatoes and tomatoes, consigned to San Francisco merchants. They were stowed under the bridge, despite the issuance of a clean bill of lading. The York-Antwerp Rules and various legal authorities were cited in support of the contention that a clean bill of lading requires stowage under decks. As the goods in this instance had been carried on deck and subsequently jettisoned the court held that general average contributions were not allowable.

The Falling Mark

GERMAN marine underwriters are inserting the following clause in their policies in order to protect themselves against the loss involved in further depreciation of their national currency:

In the case of controversy arising between the insurer and the insured which is settled before the courts or by arbitration, or in the case of payment on the part of the insurer being delayed by any other reason, the insurer is not to be liable to refund the assured for any damage accruing in consequence of the deferred payment, with exception of legal interest, unless the insurer has acted negligently or wilfully in delaying such payment.

Shipping Board Restricts Averages

IT has been decided by the United States Shipping Board authorities not to have general average statements drawn up in a considerable number of cases where their vessels may have been concerned in casualties giving rise to general average acts. The reason for this action lies in a desire to save the expense incurred in preparing statements in trivial and questionable instances. Claims for loss or damage to cargo resulting from such casualties will receive full consideration. This attitude of the board has been brought to the attention of the proper authorities at Lloyd's, London, and the latter's average department has been taking the necessary steps for putting before the Shipping Board any such claims paid by underwriters of which they may hear after receive notice. Accidents selected by the board for this treatment are those entailing but slight cargo sacrifice. The London Lloyd's is chiefly interested because of relations with Americans.

Current Admiralty Decisions of Special Interest

By Calvert B. Gill*

Limitation of Liability

IN the case of the *Harlow*, Aspinall's Maritime Law Cases, Vol. XV, Part VII, page 498, the Admiralty Division of the English High Court of Justice said, the owner of an unregistered ship is not deprived of the right to limit his liability under Sec. 503 of the Merchant Shipping Act of 1894 by reason of the fact that his ship has not been registered. The right to limit liability extended by Sec. 1, of the Merchant Shipping (Liability of Shipowners) Act, 1898, as amended by Sec. 85, Sched. 2 of the Merchant Shipping Act of 1906 to the owners, builders and other parties interested in any ship built within His Majesty's dominions, is an unqualified right and is not restricted to such period after launching as may be necessary to effect registration. Lighters used for navigation in the transport of goods on the tides, in tow of tugs and upon tides, fitted with rudders and managed by their own crews, are ships within the meaning of Sec. 742 of the Merchant Shipping Act, 1894.

Where damage is done jointly by several vessels belonging to the same owner—e.g., a tug and her tugs, by the negligence of those on board some or one of them, the owner of these vessels is only entitled to limit his liability to the aggregate amount calculated upon the several tonnages of each of the vessels which might have been proceeded against *in rem* in respect of the damage done, since as the employer of the negligent persons he might be held liable for all the damage not only in each action *in rem* but in proceedings *in personam*.

Authority of Ship's Agent

THE authority of an agent for the officers and crew of a King's ship, under the Naval Agency Act, 1864, says the High Court of Justice, Admiralty Division in the case of the *Hermione*, Aspinall's Maritime Law Cases, Vol. XV, Part VII, page 493, is not wider than that of a licitor and does not therefore extend to the settlement of claims by the ship's officers and crew without their express authority. Thus a ship's agent who settles a claim by the officers and crew of a King's ship for salvage reward without the consent expressed or implied of the commanding officer is liable in damages to the extent of the award which the officers and crew would have received if the salvage claim had been duly prosecuted, less the amount received under the terms of settlement. The agent has no authority to settle the claims of the officer (other than the commanding officer) and crew without their instructions when the commanding officer has been giving instructions on their behalf as well as his own, notwithstanding that the commanding officer takes an exaggerated view of their claims.

Seaman's Hospital Treatment

THE Act of Dec. 20, 1920, providing that any seaman brought into the United States and found to be suffering from any of the diseases set out in Sec. 35 of the Immigration Act of 1917, shall be removed to a hospital at the expense of the immigration authorities for treatment, payment for such treatment to be made by the vessel without deduction

from the seaman's wages, is paramount to the treaty between the United States and Norway, which vests exclusive jurisdiction in the Norwegian Consul over disputes for wages occurring on Norwegian ships. United States courts have jurisdiction of a suit for recovery of that portion of the wages withheld by the Norwegian Consul for the purpose of reimbursing the ship for the expenses incurred in the treatment of a seaman under the provisions of Sec. 35 of the Immigration Act of 1917. *Jernberg vs. Young*. American Maritime Cases. Vol. 5, page 426.

Valuation of Shipment in Bill of Lading

IN *Beaumont Export & Import Co. vs. New York & Cuba Mail S.S. Co.*, 286 Federal Reporter, 120, the plaintiff endeavored to recover for the loss of a caterpillar tractor which fell overboard from a vessel of the defendant. The bill of lading, under which the tractor was shipped, limited the value of each package to \$100.00. The Court said, that a provision in a steamship bill of lading issued for a shipment, wherein it was mutually agreed that, unless a higher value was stated, the value did not exceed \$100.00 per package and the freight had been adjusted on such valuation, was valid and binding and limited the damages recoverable for loss of shipment to \$100.00.

Hull of New Vessel Subject to Maritime Liens

WHEN the hull of a new vessel has been launched it becomes a vessel and a subject of maritime jurisdiction and may be subject to liens under the Act of June 23, 1910, Sec. 1 (Comp. St., 7783), says the Court in the *Pinthis* 286 Federal Reporter, 122. A claim for spare or reserve engine parts furnished to a new and incomplete vessel after she was launched, by one other than the contractor for her construction, is not one for construction, but for supplies for which a lien is given by the Act of June 23, 1910.

Due Diligence in Choosing Master Limits Award

WHERE libellant, a young and inexperienced school boy was shipped as an able seaman, though he had never before been to sea, and by reason of the bad judgment of the captain and the negligence of the boatswain, an inexperienced and incompetent man, shipping dunnage in a heavy sea, the libellant working in the hold was injured by a falling beam so that his leg was amputated considerably above the knee, the Court in *Phillips vs. United States et al.*, 286 Federal Reporter 631, said that neither the inexperience of the libellant nor the insufficiency of the equipment contributed to libellant's injury which was the result of gross error in judgment on the part of the master, so that libellant could not recover, where the operators of the vessel showed that the master had the usual certificates and that he had good recommendation and that they exercised due care in choosing him, and libellant was restricted to an award for maintenance and care.

*Attorney at law, Baltimore, Md.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Exhaust Pressures for Main and Auxiliary Engines

Q. (1,199).—Will you please give rules for finding the approximate exhaust pressure of steam leaving a cylinder after doing work therein? Information required for both main and auxiliary engines. T. L.

A. (1,199).—The final exhaust pressure for main and auxiliary machinery is usually decided upon at the start of a design, and all things which might affect this pressure are proportioned to suit.

For instance, in the case of auxiliary machinery, we will say the exhaust steam pressure has been fixed upon as 10 pounds per square inch gage. A branch from this system leads to the condenser and connects to it with a back pressure valve set at 10 pounds gage, so arranged as to relieve into the condenser should the pressure rise above this point. The rate at which the exhaust steam is to be used in heating the boiler feed water and its volume corresponding to 10 pounds gage passing per minute being known, the pipe leading to the heater is so proportioned in diameter as to give a velocity in feet per minute in accordance with accepted practice.

In the case of main engines, the vacuum in the condenser is fixed at the start. We know the pressure at the low pressure exhaust nozzle is from 1 to 1.5 pounds in excess of the pressure corresponding to vacuum. This condition, however, is only brought about by the proper number of expansions and correctly proportioned steam and exhaust passages and valve openings. A restricted exhaust opening would change our expected results greatly.

It is thus seen that the exhaust pressure of steam leaving a cylinder is a direct function of what we choose to make it at the outset rather than any calculations we would make within the cylinder itself.

How to Calculate Indicated Horsepower When Mean Pressures of Cylinders Are Unknown

Q. (1,198).—Will you please show how the indicated horsepower of an engine with the following particulars can be obtained when the mean pressure of each cylinder is not known:

Cylinder	Diameter	
High pressure	27 inches	Revolutions per minute, 72.
Intermediate pressure	45 inches	Steam boiler pressure, 180
Low pressure	74 inches	pounds per square inch.
Stroke	54 inches	

A. (1,198).—In order to answer this question assumptions will be made where data are insufficient. A close enough approximation as to the power may be made without taking into consideration cylinder clearances and piston rod areas.

C_h = cut-off of high pressure cylinder = 70 percent assumed.

A_h = area high pressure cylinder = 572.6 square inches.

A_l = area low pressure cylinder = 4300.9 square inches.

$$R = \text{ratio of expansion} = \frac{A_l}{C_h \times A_h} = \frac{4300.9}{0.7 \times 572.6} = 10.73$$

$$\text{Hypo. log } R = 2.3749$$

Allow 15 pounds drop between boilers and engine.

P = pressure in high pressure steam chest, absolute = 180 pounds.

L = length of stroke, feet = 4.5

Revolutions per minute = 72

$$S = \text{piston speed, feet per minute} = 2 \times L \times \text{RPM} = 2 \times 4.5 \times 72 = 648$$

p = back pressure = 3 pounds, assumed.

P_m = theoretical mean effective pressure referred to the low pressure cylinder, pounds per square inch.

$$= P \times \frac{1 + \text{hypo. log } R}{R} - p = 180 \times \frac{1 + 2.3749}{10.73} - 3 = 53.6$$

E = ratio of actual to theoretical mean effective pressure = (clearance not considered) 0.56 to 0.61 for three cylinder triple expansion engines. Use 0.585.

$$P_r = \text{mean effective pressure} = P_m \times E = 53.6 \times 0.585 = 31.4$$

Indicated horsepower =

$$\frac{P_r \times S \times A_l}{33,000} = \frac{31.4 \times 648 \times 4300.9}{33,000} = 2,650$$

Basic Design Problem

Q. (1,200).—In his last installment of the article on the Dyson method in the August, 1921, issue of MARINE ENGINEERING AND SHIPPING AGE, Dyson says,

"... in choosing the point of design care must be taken to plot chp/EHP well above the basic S curve."

and in the program sheet he has, "v/V for chp/EHP."

Does this mean that the choice of v/V is arbitrary on the part of the designer and bears no relation to chp/EHP at the moment of selection?

Comparing this with an article by Mr. Bates in the April, 1921, issue of MARINE ENGINEERING AND SHIPPING AGE on design of screws for tunnel stern vessel, I find a series,

ehp/EHP	.223	.300	.371	.445	.52
v/V	.652	.714	.771	.822	.869

Is the selection v/V purely at random? The third decimal seems a rather exact figure for random selection. If the v/V value results from initial choice of chp/EHP, how is the value v/V found. Dyson's articles are far from clear on this point, being rather composed for analysis than design.

Again, having sufficient data for merchant ships, assumed as standard, and having derived a chart similar to Dyson's No. 1, how could direction lines be determined for H/B greater than standard, as in Dyson's Fig. 2?

A. (1,200).—I have been unable to find in Admiral Dyson's article of August, 1921, the quotation to which you refer. Your question will, however, be answered.

It is customary after determining the basic slip (S) value to assume various values of chp/EHP with corresponding values of v/V. These values of v/V should be so chosen at a safe distance above the basic slip line that when K is taken into consideration there is no danger of the propeller being in cavitation.

In order to determine in the beginning the largest chp/EHP that can be used with its corresponding v/V with safety, the procedure should be as follows:

First. On Fig. 8 (May, 1921) pick a point on your S curve having an chp/EHP value in the vicinity of what

might be expected for the type of vessel in question. Denote this power factor by $(\text{ehp}/\text{EHP})_g$ and read off the corresponding value of v/V .

Second. Use Curve 4, Fig. 7 (May, 1921). Read values on left hand scale corresponding to $(\text{ehp}/\text{EHP})_g$ which we will call Z_g .

Third. $Z_p = Z_g + \log K$.

Fourth. Again use Curve 4, Fig. 7. Read value on bottom scale of ehp/EHP corresponding to Z_p of the third step. The value of ehp/EHP is the maximum which could be used with the v/V taken with safety.

This propeller would be out of, but close to, cavitation, so to be doubly safe when loaded or in rough weather a value of ehp/EHP somewhat to the left or of v/V somewhat higher up should be chosen as one starting point. A series of such points should be found and used as a basis for design.

Referring to the propeller design of April, 1921, the values of v/V were readings taken on the S curve referred to above and were exact readings from a chart having a much finer scale than that of Fig. 8. The same is true of Fig. 7. While these readings may seem rather exact, yet to get consistent results it is often necessary; especially is this true when it is desired to plot a smooth curve of a propeller's expected performance.

The first part of this answer, I think, shows that the choice of v/V is not at random.

Charts Nos. 1 and 2 hold for merchant as well as naval vessels. It is possible that I do not understand the question.

LETTER TO THE EDITOR

Progress of Welded Construction

LIKE all new methods, especially those of the more radical order, welded construction for marine vessels continues to meet with much opposition on the part of shipbuilders. Strangely enough, the latter appear ever ready to utilize the welding art for their emergency problems whether plant repairs, correction work or new construction. The paradoxical feature of this situation is the ready acquiescence of our inspection bureaus to the use of welding for the repair of worn or damaged pressure parts of boilers, and important strength members in the ships' structure, while the use of welding for new construction of those same parts is strictly forbidden.

As a result of several years' active propaganda, reinforced by very extensive exhibits of laboratory research and practical field operations, the barrage erected in the progress of welding has been gradually weakened so that there now remains in the ammunition chest of the opposition only two "last shots," viz.: "Erection" and "inspection."

Even these appear to be no longer effective as it is recorded, both in historical reports and by photographs, that important structures have been erected and welded in perfect alignment and with absolute metal-to-metal contact without a single perforation of plates for bolting up. The system is so simple and withal inexpensive and efficient that it must eventually be utilized for the assembly of any size or form of structure, whether boss plates, stringer plates or mast fittings, to the exclusion of all present methods.

It is a fact also that the quality of any weld can now be quickly determined by a very simple, inexpensive method without damage to the seam structure. Any inspector or helper of reasonable intelligence can readily master the art and there is no longer any reason why the classification societies need refuse to accept welded construction because of uncertainty regarding the quality of the weld.

New York.

WILLIAM T. BONNER.

American Delegates Appointed to International Navigation Congress

AMERICAN delegates to the thirteenth International Congress of Navigation, which will meet in London in July, under the auspices of the Permanent International Association of Navigation Congresses, have been named by Secretary of State Hughes, following the receipt of an invitation from the British government.

The congress will deal with questions of inland and ocean navigation, largely from an engineering viewpoint. Membership of the United States in the association was authorized by congress in the rivers and harbors act of 1902.

The American delegates, who were selected from government departments concerned with navigation, include the following:

Colonel J. C. Sanford, Corps of Engineers, U. S. A., retired.

Captain Frank T. Chambers, C. E. C., United States Navy.

Colonel J. C. Oakes, Corps. of Engineers, U. S. A.

Major O. N. Solbert, U. S. A., military attache at the American Embassy in London

Captain Charles L. Hussey, naval attache at the American Embassy in London.

Rear Admiral William E. Reynolds, commandant of the United States Coast Guard.

John C. Hoyt, hydraulic engineer, United States Geological Survey.

Colonel E. Lester Jones, director of the Coast and Geodetic Survey.

George R. Putnam, commissioner of lighthouses.

Walter Tower, commercial attache at the United States embassy at London.

Captain W. F. Purdy, operating manager of the United States Shipping Board at London.

Huntington T. Morse, European manager of the Emergency Fleet Corporation.

Inventor of Thermit Welding Dies

PROF. DR. HANS GOLDSCHMIDT, inventor of the widely known thermit process for welding iron and steel and for producing high grade metals and alloys, also originator of many other scientific inventions, died suddenly in Baden-Baden, Germany, on May 20, after a stroke.

Prof. Goldschmidt was born in Berlin, Germany, on January 18, 1861. His father was the proprietor of chemical works and tin smelters which he had founded in 1847. After having been graduated from the "gymnasium" of Altenburg, Hans Goldschmidt studied chemistry, physics and natural sciences in general at the universities of Berlin, Leipzig, Heidelberg, Strassburg and at the Institute of Technology at Charlottenburg.

In 1887 Prof. Goldschmidt entered the firm of Th. Goldschmidt, Essen Ruhr, Germany, in joint partnership with his brother Dr. Karl Goldschmidt. The attention of the latter was applied mainly to the business management of the company, while Prof. Hans Goldschmidt devoted himself to scientific research. Under their joint guidance the firm grew to international importance, with agencies and allied companies throughout the world.

Prof. Goldschmidt visited this country very frequently and was president of the Goldschmidt Thermit Company, now Metal & Thermit Corporation, from 1904 to 1916.

JOHN GILBERT WARD, treasurer of the Babcock and Wilcox Company, New York, died on April 22.

PERSONAL MENTION

J. C. CLIFFGUARD, assistant manager of the department of construction and repairs of the Standard Oil Company, is in Europe investigating different types of Diesel engines.

JAMES McNAUGHT, vice-president of Esplen Sons & McNaught, naval architects and marine engineers, has been sent to various European countries by the Standard Oil Company to report on the Diesel engines as manufactured abroad.

J. K. HUTCHISON, until recently chief engineer of the steamship *Maracaibo*, has been appointed chief of the new passenger and freight ship *Carabobo*, under construction for the Red D Line at the New York Shipbuilding Corporation's yard, Camden, N. J.

W. J. GIBSON, who has been appointed chief steward of the *Leviathan*, is considered by many shipping executives to be the dean of all stewards. Mr. Gibson's first appointment as a chief steward was on the *Britannic* of the White Star Line when she was employed in carrying troops to the Boer war in 1901. He served in this capacity until the end of the war when he was transferred as chief steward to the old *Majestic* of the White Star Line. In 1903 he was again transferred as chief steward of the *Ionic* which at that time was on the New Zealand route. After service on the *Ionic* for over a year he joined the *Teutonic* on the New York route. Some months later he was transferred to the *Cretic* in the Mediterranean service and, while in this service, he also served on the *Republic*. In 1907 he was transferred as chief steward to the *Celtic* which at that time was one of the principal liners on the New-York run. He served three years on the *Celtic* and then went to the *Baltic* in 1910. In 1911 he was transferred to the *Adriatic* and in March, 1912, he assumed the duties of chief steward on the steamship *Olympic*, which is now one of the principal vessels of the White Star Line. Mr. Gibson remained on the *Olympic* until he decided to become an American citizen, whereupon he resigned and came to America. His first position in America was as chief steward on the *Finland* of the American Line. At the outbreak of the war he was appointed purchasing agent for the Shipping Board at Baltimore where he remained until the armistice was signed. He then accepted the position of supervising chief steward of the International Mercantile Marine Company until he was offered and accepted the position as chief steward on the *Leviathan*.

GEORGE F. MURPHY, formerly Pittsburgh manager of the Heine Boiler Company, has been placed in charge of the New York office of this company upon the retirement of Paul H. Brangs and the resignation of his son, Harold A. Brangs. Mr. Murphy will be assisted by J. L. Daly and G. A. Knowles.

ROBERT H. LAVERIE, president of Robert H. Laverie, Inc., consulting engineers, hull, machinery and cargo surveyors, 17 State street, New York, announces that his company has

taken over Messrs. Banghart and Shaumburg (formerly connected with Price, Banghart and Company) and has established a cargo division which will be under the direct supervision of Charles M. Banghart.

OBITUARY

JESSE L. WHEELER, formerly a shipbuilder and designer in the New York Navy Yard, Brooklyn, N. Y., died recently at his home in Brooklyn, aged 89.

CAPTAIN GEORGE COLLINS, river pilot, and formerly captain of one of the Wilson Line boats plying between Philadelphia, Pa., and Wilmington, Del., died at his home in Philadelphia on May 17.

FRANK E. WING, secretary-treasurer of the L. S. Starrett Tool Company, and secretary of the Athol Machine Company, Athol, Mass., died on May 13, following a long illness, aged 58. Mr. Wing's entire business life was spent with the Starrett company.

JAMES WOLLEY, one of the best known figures of the North Atlantic waterfront and head of the Commercial Towing Company, since it succeeded the Commercial Towing Company in 1887, died recently at his home in East Boston, Mass., aged 85 years.

CAPTAIN BENJAMIN A. SMITH, who for a quarter of a century has been a principal figure in the Gloucester fishing industry and who was instrumental in putting Gloucester fishing schooners into the races for the international championship, died May 7 at his home in Gloucester, Mass.

CAPTAIN FRANCIS G. COXON, marine superintendent of the Booth Steamship Company, died recently at his home in Brooklyn, N. Y., at the age of 62. Capt. Coxon was born in England and came to this country 16 years ago and for many years was in the employ of the Booth Steamship Company.

WILLIAM SHREEVE DORAN, president of the Alberger Pump and Condenser Company, New York, died at his home in that city May 12 after a few months' illness, at the age of 58. He was born in Bristol, Pa., and early in his career became identified with the steam pump making concern of Henry R. Worthington. For years he was regarded as one of the country's authorities on condenser operations. He was long a member of the Engineers' Club and since 1921 was vice-president.

REAR-ADMIRAL WILLIAM SHEFFIELD COWLES, 76 years old, brother-in-law of former President Theodore Roosevelt, died at his home in Farmington, Conn., on May 1. During the Spanish war Rear-Admiral Cowles was in command of the gunboat *Topeka*. He was retired on August 1, 1908, after 45 years in the naval service. At that time he was chief of the Naval Bureau of Equipment and a member of the Board of Construction. During President Roosevelt's administration Rear-Admiral Cowles, then a commander, was the President's naval aide.

CAPTAIN ALEXANDER McDougall, seventy-eight years old, internationally known shipbuilder and inventor, died on May 23 at his home in Duluth, Minn., following an operation. Captain McDougall, after sailing the Great Lakes for twenty years, obtained the assistance of Captain Thomas Wilson, of Cleveland, in building the first whale-back. As president of the McDougall-Duluth Company, during the war, he directed construction of a large fleet of lake freighters and steamers for the Great Lakes and coast-wise trade.

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

Shipping Problems Discussed at Marine Association Banquet

AT the spring banquet of the American Marine Association, which was held at the Waldorf-Astoria, New York City, on the evening of May 3, Frank J. Shipman, acting president of the association, outlined the aims and achievements of the organization and introduced as toastmaster Mr. Charles H. Potter, president of the United States Ship Operators Association. Sounding the keynote of the evening as the American merchant marine Mr. Potter introduced Senator Royal S. Copeland, of New York, who expressed the opinion that the merchant marine would be of little use without freight or cargo and suggested it was first necessary to rehabilitate the nations of the world so that commerce of the world could resume its normal flow. Replying to Senator Copeland, Stevenson Taylor, president of the American Bureau of Shipping, pointed out the fact that if we wait for the resumption of the world's commerce some other nation would carry it.

Alfred G. Smith, president of the American Steamship Owners Association, vigorously opposed direct government operation of ships and stated that the only way out of present difficulties is for the Government to sell its vessels as rapidly as possible, retire from business as soon as possible and provide regulations to make private competition possible. He pointed out that direct government

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Twenty-four Millions to Be Asked By Shipping Board for New Ships to Replace *Agamemnon* and *Mt. Vernon*

A POSSIBLE expenditure of \$24,000,000 for the construction of two new passenger ships for the transatlantic service, to operate in conjunction with the *Leviathan*, is seen in the latest resolution from the Shipping Board, in which it is considered too costly to recondition the *Agamemnon* and *Mount Vernon* at a total estimated price of close to \$16,000,000, the plan to construct two new ships of a similar type at a total cost of about \$24,000,000 being substituted.

Plans and specifications for the reconditioning of the *Agamemnon* and *Mount Vernon* have been under preparation by the firm of Gibbs Brothers, Inc., 1 Broadway, New York, and were understood to be rapidly nearing completion. It was stated that the principal work to be carried out under the proposed specifications included the construction of "blister" tanks on the port and starboard sides of each of the hulls extending about three-quarters of the length of each vessel, tapering in to present lines and designed to increase the stability of the ships as well as furnishing space for the carrying of fuel oil and ballast. The ships

were also to be converted from coal to oil burners, which would involve a great quantity of piping, valves, pumps, etc.

The resolutions made by the Shipping Board with regard to these two ships were announced as follows:

"Whereas it had originally been contemplated that the reconditioning of the *Agamemnon* and the *Mount Vernon* in order to place them in transatlantic service in conjunction with the *Leviathan* would require an expenditure of a maximum of \$4,000,000 per ship; and

"Whereas careful plans and estimates prepared upon order of the United States Shipping Board and now just submitted show that a minimum of \$8,000,000 per ship will be required for such purpose; and

"Whereas it is estimated that new ships of modern construction and similar type would cost \$12,000,000 per ship; it is hereby

"Resolved, That the United States Shipping Board regards an expenditure of \$8,000,000 per ship for reconditioning twenty-year-old vessels when \$12,000,000 would construct new ships of similar type, as not justified; therefore be it further

"Resolved, That the *Mount Vernon* and



Spring Dinner of the American Marine Association at the Waldorf Astoria Hotel, New York, on May 3

the *Agamemnon* not be reconditioned, but that in the next budget the United States Shipping Board will make request of Congress for such additional appropriation as would be required for the construction of two modern ships, smaller in size than the *Leviathan*, but comparable in every way for transatlantic service in conjunction with the *Leviathan*."

Eastern Company's New Program to Cost \$3,500,000

NORFOLK, Va. (Special).—Plans of the Eastern Steamship Lines for financing extension of service of their lines, among which is the Old Dominion Transportation Company operating between this city and New York, have been approved by stockholders, according to information just received from Boston.

The company will issue new stock to provide \$3,500,000 for carrying out the program decided upon since the acquisition within the last two months of the Old Dominion Transportation Company, and the Old Dominion Steamship Company, which formerly operated on the Norfolk-New York route.

Not only will Norfolk get a daily service to New York, but other lines operated by the Eastern Steamship Lines will be given additions and improvements in service.

Shipping Board Increases Seamen's Wages

AFTER several conferences between the representatives of the United States Shipping Board and representatives of the International Seamen's Union with reference to wages and conditions of seamen on Shipping Board vessels, and after thorough investigation by the Board the following increase in seamen's wages were announced, effective May 14, with certain changes in working conditions such as the inauguration of the three-watch system instead of the two-watch system and the observance of the eight-hour day in port:

	Old Scale	New Scale
Carpenter	\$70.00	\$80.00
Carpenter's mate	60.00	70.00
Boatswain	65.00	75.00
Boatswain's mate	60.00	70.00
Quartermaster	60.00	70.00
Able seaman	55.00	62.50
Ordinary seaman	40.00	47.50
Storekeeper	60.00	70.00
Deck engineer	70.00	80.00
Pumpman	70.00	80.00
Donkeyman	65.00	75.00
Storekeeper	65.00	75.00
Oiler	65.00	72.50
Fireman:		
Oil burner	57.50	65.00
Coal burner	57.50	67.50
Coal passer	50.00	60.00
Wiper	50.00	57.50
Watertender	65.00	72.50

Shipping Problems Discussed at Marine Association Banquet

(Continued from page 379)

ment operation is impractical and therefore unwise but that by open and frank deliberation between government representatives and private operators the shipping problem might be gradually worked out.

Joseph E. Sheedy, vice president of the Emergency Fleet Corporation, gave a detailed account of the constructive measures carried out by the Shipping Board in the operation of its vessels.

Proposed Oceanic Ships Are to Be Modernly Equipped Passenger and Cargo Carriers; Details of Construction

FINAL decision as to whether or not the Oceanic Steamship Company, of San Francisco, Cal., will build two new passenger and cargo ships for the San Francisco-Australia service, is expected in the near future, according to official information obtained by MARINE ENGINEERING AND SHIPPING AGE. Frederick S. Samuels, assistant to the president of the company, has been in Washington with the proposal to the Shipping Board and the Postmaster General that the company will build these ships if they can obtain a reasonable compensation under Section 24 of the Marine Act of 1920

and providing that the cost of construction is not excessive. Although plans and specifications are ready to go out the bids will not be asked until favorable action is taken.

The proposed vessels are to have an overall length of 500 feet, propulsion to be by two Curtis turbines, direct-connected generators (3,640 R. P. M.), and two synchronous motors (5,000 S. H. P.), steam being supplied by six B. & W. watertube boilers burning oil for fuel.

The ships, if built, are to be put into the San Francisco-Honolulu-Pago Pago-Sydney service. The principal data concerning the proposed ships is as follows:

CHARACTERISTICS

Length, over all.....	500'-0"
Length, B. P.....	475'-0"
Beam, molded.....	63'-0"
Depth M. L. D. to Upper Deck..	40'-0"
Load Draft.....	25'-0"
Block coefficient at 25'-0" draft.	0.631
Midship coefficient at draft.....	0.974
Prismatic coefficient at draft....	0.648
Speed	18 K.
Cruising Radius @ 15 K. 25' D.	
Nautical Miles	20,800
Framing	transverse
Class A-1—American Bureau and Lloyd's Register.	

TONNAGES

Weight of Ship, light.....	7800 T.
Displacement @ 25' d.....	13600 T.
Deadweight Capacity.....	5800 T.
Tons per inch @ 25' d.....	54.5
Deadweight cap. @ 26' d.....	6464 T.

DECK MACHINERY

Steering Gear	Electric hydraulic
Windlass, vertical type.....	Motor-driven
Capstans, 4, motor driven.....	Dock type
Winches, 8, compound geared.....	Motor-driven

LIFE-SAVING EQUIPMENT

Lifeboats, 8, double-ended, 50 persons.....	28'-0"
Motorboats, 2, 50 persons.....	28'-0"
Workboat, 1, ...	20'-0"

PROPELLING MACHINERY

Boilers.....B. & W. Watertube.....	6
Fuel	Oil
Number of burners per boiler.....	5
Draft, forced—Independent closed ashpit type.	
Heating surface	25,056 sq. ft.
Working Pressure	265 pounds
Superheat	160 deg.
Normal fuel consumption, 25'-0" Draft, 15 K.....	57 tons per day
Fuel per horsepower hour.....	0.85 lbs.

ENGINES

2 Curtis turbines direct connected to generators.....	3640 R.P.M.
2 Synchronous Motors, each.....	5000 S.H.P.
Revolutions per minute	120
Overload capacity	15%
Revolutions @ overload 5750 S.H.P.....	130
Steam Consumption per S.H.P.....	9 lbs.
Normal shaft horsepower.....	10,000
Overload shaft horsepower.....	11,500

PROPELLERS—NO. 2

Type—4 blade, built up manganese bronze blades and cast iron hubs, about 14'-0" diameter and 18'-0" pitch.

AUXILIARY MACHINERY

Refrigerating Machines—Vulcan marine type	2
Condensers, Main	2
Condensers, Auxiliary	1
Evaporators	2
Distillers	1
Feed Water Heater.....	1
Feed and Filter Tanks.....	1
Pumps, Motor and Steam Driven...	20

AUXILIARY ELECTRICAL
EQUIPMENT

- 300 K.W. General Electric D. C. generators driven by Curtis turbines.
— 5 K.W. Gasoline driven emergency set.

CAPACITIES

CARGO No. 1 hold @ 40 cu. ft.	
per ton	1013 T.
2 hold @ 40 cu. ft.	
per ton	2326 T.
3 hold @ 40 cu. ft.	
per ton	614 T.
4 hold @ 40 cu. ft.	
per ton	922 T.
Total	4875 T.
Refrigerated Cargo.....	18270 cu. ft.
Refrigerated Ship's Stores.....	7130 cu. ft.

BUNKERS

Deep Tanks 2	1725 T.
Ving Tanks 4	740 T.
Double Bottom 4	735 T.
Betting Tanks 2	50 T.
Total	3250 T.

FRESH WATER

Drinking Water 1	100 T.
Culinary Water 4	395 T.
Boiler Feed 2	270 T.
Total	765 T.

BALLAST

Fore peak	100 T.
To. 1 double bottom.....	87 T.
To. 2 double bottom.....	230 T.
To. 7 double bottom.....	50 T.
After peak	60 T.

America Must Build
MotorshipsShipowners Cannot Safely Ignore
Possibilities of Diesel Propelled Vessels

DECLARING that his recent trip abroad, in which he visited every important manufacturer of Diesel engines, had been a revelation to him, Mr. A. S. Hebble, superintendent engineer of the Southern Pacific Lines, told the Propeller Club at a recent luncheon that he had learned a great many things about the Diesel that he had not known before.

Although I called at the shipyards and repair plants of practically all the maritime countries, said Mr. Hebble, I could only find two motorships undergoing repairs. The Diesel engine, he asserted, is not such a complicated affair as some would have us believe, and we should have little difficulty in securing efficient operating engineers.

A significant indication of the trend toward motorships in Europe, Mr. Hebble declared, is the fact that one of the greatest English shipping executives has recommended that our company shall not build any more steamers. Another point that he brought up was that while there are 876,000 tons of motorships in commission there are now 1,000 tons under construction.

Practically every bit of trouble that has been experienced with motorships, Mr. Hebble pointed out, has been due to poor fuel. The time when we can use Mexican crude oil in Diesel engines is still far off, he declared. If this was not so we would

Cable Supply Ship Dickenson Completed



Vessel, Designed by Cox & Stevens, New York, Leaving Sun Shipyard on May 23 for Honolulu with Captain Piltz in Command



Superintendent's Room



Dining Room

Staten Island Shipbuilding Co.
Is Low Bidder for Construction
of New York Central Ferryboat

THE Staten Island Shipbuilding Company submitted the lowest bids for the construction of a steel ferryboat for the New York Central Railroad Company at the opening of tenders on May 15. Two sets of prices were offered, one providing for equipment with machinery supplied by the W. & A. Fletcher Co., Hoboken, N. J., the other for machinery supplied by the builder. Staten Island's price in the former case was \$479,700 and in the latter \$469,700.

The vessel, which was designed by J. W. Millard & Brother, of 17 State street, is to have a length over guards of 210 feet, beam over guards 66 feet 2½ inches, depth amidships 17 feet 6 inches. Propulsion is to be by two direct-acting 2-cylinder compound, jet condensing steam engines, 19 by 38 by 28 inch stroke, steam to be supplied by two Scotch return tube boilers with steam pressure at 150 pounds. Proposals were submitted from seven yards.

never build another steamer. Some Diesel engine manufacturers claim that their engines will operate on crude oil but, in his opinion, nothing but the best grade of fuel oil should be used.

Pa. Second bids were opened on March 28, the Crook Company's price in this case being \$174,240.

Tug Contract Awarded

The contract for the construction of the single screw steel towboat *John Wanamaker* has been awarded the H. E. Crook Company, Inc., of Baltimore, by the Department of Wharves, Docks & Ferries, Philadelphia,

Bids June 22 for Four
Motor Tugs

The United States Engineer Office, 815 Witherspoon Building, Philadelphia, Pa., will receive bids until June 22, 1923, for constructing and delivering four 50-foot steel motor tugs. Information on application.

Atlantic Coast Shipbuilders Elect Officers

At the annual meeting of the Atlantic Coast Shipbuilders' Association held in Philadelphia, Monday, May 14, Harry A. Magoun, vice-president of the New York Shipbuilding Corporation, was elected president of the Atlantic Coast Shipbuilders' Association to succeed J. L. Ackerson, of the Merchants' Shipbuilding Corporation. Chas. P. Wetherbee, of the Bath Iron Works, was elected vice-president, J. Harry Mull, of the William Cramp & Sons Ship and Engine Building Company, was elected treasurer, and Clarence S. King was re-elected secretary.

The following were elected members of the executive committee: W. G. Coxe, chairman; J. H. Mull and J. G. Pew.

Chamber of Commerce Opposes Government Operation of Ships

THE following resolutions, submitted by the Marine Bureau of the Chamber of Commerce of the United States, relative to the merchant marine, were unanimously adopted at the annual meeting of the National Chamber held last month in New York:

MERCHANT MARINE

It is necessary for the national defense and the proper growth of foreign and domestic commerce that the United States should have an adequate merchant marine, ultimately to be owned and operated privately by citizens of the United States. The Chamber is unalterably opposed to the Government engaging in commercial business, for the reason that such a course is economically inefficient, is against public interest and is in contravention of the fundamental purposes of the Government.

The Chamber therefore urges upon the President of the United States and the Shipping Board that, before the Board enters upon the commercial venture of direct operation of its Government-owned ships, further efforts should be made by counsel and collaboration with responsible shipping interests of the United States to evolve a plan by which the ships necessary to maintenance of essential services may be operated by private citizens of the United States, with a view to their acquisition and ownership by citizens as soon as they can be made self-sustaining.

To this end we ask careful consideration of the possibility of relief of private American shipping interests from inequality in world competition, believing that relief is obtainable through the relaxation or removal of burdensome restrictions without departure from proper requirements for public safety.

OCEAN BILLS OF LADING

The last annual meeting testified to the Chamber's continuing interest in the Hague rules respecting the bills of lading under which merchandise is carried by sea. These rules should result in rights and liabilities as between vessels and shippers which are equitable to both, are suited to the conditions of carriage of goods by sea and are calculated to facilitate the use of ocean transportation. After a year of discussion the Hague rules were, in the latter part of 1922, revised in order that they may further promote these purposes. In the revised form they have been accepted by a diplomatic conference, in which the United States was represented. Appropriate action should be taken for ratification of these rules, in order that further progress may be made.

Over Twenty-two Millions to Be Spent in Port of Houston, Texas, Including Piers and Equipmen

MUNICIPAL and private enterprises are planning and carrying out improvements in the Port of Houston, Tex., which will cost considerably in excess of twenty-two and one-quarter million dollars, according to official information obtained by MARINE ENGINEERING AND SHIPPING AGE. Among the activities of the private enterprises, the Houston Lighting and Power Company, through its president, E. B. Parker, has just announced that their new electric power plant, on which construction has been commenced on the Houston Ship Channel, will be of an ultimate capacity of 200,000 kilowatts and will involve an expenditure during the next five years of approximately \$10,000,000. This plant will use crude oil for fuel and will have their own storage tanks together with their own wharf, which will be equipped to handle oil from tank steamers.

The Sinclair Refining Company is now actively engaged in the construction of a wharf of creosoted timber, 1,000 feet in length and 50 feet wide, at their refineries' site on the Ship Channel. The company is also installing two new batteries of high pressure stills and it is understood that their building program for the next seven months contemplates the outlay of \$1,000,000 per month, which includes pipe line connection about to be completed between their plant and the North Texas and Oklahoma oil fields with an extension to the fields of Wyoming.

\$4,000,000 BOND ISSUE

As previously announced in these columns, the Harris County Houston Ship Channel District has voted a bond issue of \$4,000,000 for the construction of six new wharf units, approximately 500 feet in length each, and a 1,000,000-bushel grain elevator with workhouse and machinery design, to handle 6,000,-

000 bushels and the additional storage to be added as needed. The Port Commission advertised for bids to be opened May 7, the dry excavation on the site of the wharves, amounting to approximately 100,000 cubic yards, and also for the construction of two large storm sewers to provide drainage for the areas back of the wharves. A contract has been let to the J. S. Metz Company for the engineering and design of the million-bushel grain elevator. The hydraulic dredging on the north side of the harbor along the site of the wharves is now under way with government plants and a government contract will be awarded in near future to complete this part of the work.

Three sets of mooring clusters with ways to shore have just been constructed adjacent to the Manchester wharf to provide a berth for vessels waiting their turn at the wharf. A carrier house with 1,000 bushel elevator and flour mill of the Houston Mill & Elevator Company to the Port Commission's Manchester wharf and will be ready to handle grain shipments in the coming season.

CHANNEL WORK

An allotment of \$1,100,000 from the river and harbor bill has been made for the extension of the 30-foot depth in the Houston Ship Channel and when contracts are awarded covering this sum there will only be approximately two miles additional work to be done, thirty-eight miles out of the total length of fifty miles having already been completed. Plans and estimates for the construction of about five miles of Public Belt Railroad along the north side of the channel.

PRIVATE ENTERPRISES

The Anderson Clayton Company has completed the dredging work for their wharf and pilings are now being driven. The two-story concrete sheds, consisting of ten units 100 feet by 150 feet with high density cotton compress in the center, are under construction. These sheds will be built of reinforced-concrete equipped with sprinkler system and electric trolleys for rapid handling of cotton. The wharf will be 1,525 feet in length and the entire project is to be ready for operation by August of this year.

The Alexander Sprunt Company, operating the Ship Channel compress a short distance below the Anderson Clayton plant, is contemplating the construction of a wharf 800 feet in length with suitable shed for rapid handling of export cotton.

The Texas Portland Cement Company announced recently that they propose to increase the capacity of their cement plant from 700,000 to 800,000 barrels per year while the Galena Signal Oil Company is understood to have under contemplation some extensive additions to their oil refinery on the Ship Channel. The Houston Oil & Refining Company is steadily adding to the capacity of its plant at Baytown, twenty miles down the Ship Channel from Houston.

The Houston & Refining Company recently installed new stills and a new plant, involving a cost of about \$100,000, and two weeks ago shipped a full cargo of case oils and gasoline to Australia from the Port of Houston.

Business Notes

The San Francisco office of The New London Ship and Engine Company, of Groton, Conn., has been moved to 203 Balfour Building and is in charge of S. Burke Smith.

The American Balsa Company, Inc., has announced a change of address and telephone number to 152nd and Exterior streets, New York City; telephone, Mott Haven 1393.

The Manitowoc Shipbuilding Corporation, Manitowoc, Wis., has added another section to its steel floating dry dock that will enable the company to dock vessels up to 500 feet.

The Sprague Electric Works of the General Electric Company has consolidated its district and local offices with corresponding offices of the General Electric Company.

The New York office of the Aero Alarm Company has contracted to extend the Aero alarm system on the steamships *America* and *President Adams*. The Seattle office has contracted to extend the Aero alarm system on the *President Madison*.

William M. Connelly, formerly a marine lawyer, has been appointed manager of the steamer *Fordonian*, offices at No. 822 Marine Trust Building, Buffalo. The *Fordonian* is said to be the only Diesel electrically propelled boat on the Great Lakes. She has a carrying capacity of 3,800 tons.

Foreign Shipping and Shipbuilding Activities

Provisional Program of Institution of Naval Architects' Summer Meeting in Holland

September 1. Arrival at Flushing at 4 p.m.*
September 2. Trip to Middelburg, Veere, lunch at Domburg. Return to Flushing.
September 3. (a) Visit to the Royal Shipbuilding and Engineering Company, "de IJchelde," Flushing. Lunch given by "de IJchelde." Council Meeting. Papers to be read and discussed. (b) Visit to Middelburg. Leave about 4 p.m. Arrival Scheveningen (near The Hague)† at 7.30 p.m.
September 4. Day trip to Amsterdam. (a) Visit to Amsterdam Dry Dock Company, or Netherland Dry Dock Company. Lunch given by Netherlands Shipbuilding Company. Visit to the Netherlands Shipbuilding Company and to the Netherlands Machinery and Railway Material Factory Werkspoor." (b) Visit to Volendam & IJcken. (c) Visit to The Rijksmuseum and the Historical Nautical Museum. Return to Scheveningen.

September 5. (a) The Hague. Papers to be read and discussed. (b) Sight seeing. Visit to Mutters Ship Decorative Works at 4 p.m. (tea at Mutters).

September 6. (a) Visit to Gusto Works, IJcken. Visit to Rotterdam Dry Dock Company. Lunch given by New Waterway Shipbuilding Company. Visit to the New Waterway Shipbuilding Company and to IJcken's Engineering and Slipways Company. (b) Visit to Leyden and trip to the IJcken District.

September 7. Visit to Rotterdam Nautical Technical Institute and Museum. (a) Trip through Rotterdam Harbor. (b) Visit to IJcken Burgerhout Works. Lunch given by IJcken Burgerhout Shipbuilding and Engineering Company. Return to Scheveningen. Reception and tea given by Koninklijk Instituut van Ingenieurs. Official Dinner given by the Institution of Naval Architects.

September 8. Return from Flushing to IJckenstone or Dover. Lunch on board the mailsteamer *Insulinde*, given by Mr. B. E. IJcken, manager of the Rotterdamsche Lloyd.

*The reception committee will provisionally reserve hotel accommodation at Flushing and Scheveningen for as many as signify their intention of taking part in the meetings. Rooms will be definitely allocated at a later date.

†Alternative visits are indicated by letters (a) (b) (c).

First German de Luxe Steamer to Enter Transatlantic Service Since the War

The *Albert Ballin*, which will be the first German de luxe to be placed in the transatlantic service by a German company since the war, is now nearing completion at Hamburg from which port she is scheduled to sail for New York on July 5. The *Albert Ballin*, and her sister ship the *Deutschland*, which will go into service later in the year, 22,000 tons gross register, and embody latest ideas of marine construction, notably a new stabilizing device which combines an anti-rolling tank and the bilge bulge. This device has already been successfully applied to naval craft but the *Albert Ballin* will be the first liner to have it.

Atlantic Transport Line to Resume Passenger Service

RESUMPTION by the Atlantic Transport Line of its direct passenger service between New York and London is one of the outstanding events in ocean steamship travel for 1923.

The original "Minne" class ships—the *Minnewaska*, *Minnetonka*, *Minneapolis* and *Minnehaha*—having been lost in the war, a new class of four ships, preserving all the essential features that made the old vessels popular, but of greater size and with every improvement essential to modern ocean-travel comfort, are being now created to take their places.

NEW VESSELS BUILDING

First of these vessels to be completed is the *Minnewaska*, 21,000 tons, which was launched on March 23, 1923, at the Harland & Wolff Works, Belfast, Ireland, and scheduled to make her first sailing from London to New York on August 4, 1923.

MAIN PARTICULARS

Length	626 feet
Beam	80.37 feet
Depth	54 feet
Gross tonnage	21,000 tons
Cargo capacity	17,000 tons
Horsepower	15,000
Speed	17 knots
Number of boilers (oil burning)	12
Propelling machinery	Twin screw turbines
Number of passengers	369

NEW YORK-LONDON SERVICE

According to Atlantic Transport Line practice, the itinerary of the new ships will be the same as that of the old, namely, New York-London, London-New York direct, without stops at intermediate ports of call. The ships will sail from Pier 58, near the foot of Sixteenth street, New York City, on their eastward voyages, and from the new King George V docks, directly at the door of the world's metropolis, when westward bound.

PASSENGER ACCOMMODATIONS AMIDSHIPS

On these new ships all passenger quarters are amidships, four decks in all being devoted exclusively to passenger accommodation. A deck is given over entirely to public rooms. B deck is occupied principally by suites and the larger staterooms. The dining saloon and reception room are on D deck.

International Navigation Week at Gothenburg, Sweden

Gothenburg, Sweden (Special).—Plans have been completed for a series of international conferences and special exhibitions for "Navigation Week," at the Tercentenary Jubilee Exposition in Gothenburg, Sweden. Navigation week begins on August 1, and during the week conferences of shipowners, shipbuilders, marine underwriters, and others connected with navigation will be held. The most important of these is the International Navigation Congress which will be held under the auspices of the British Chamber of Shipping.

Gothenburg, as Sweden's leading seaport, has spared no pains to make this navigation week of international importance. In connection with the Jubilee Exposition there is a special exhibit devoted to navigation and

Canadian Government Canal and Harbor Work to Cost \$15,000,000

ACCORDING to latest announcement, the Dominion Government, Ottawa, Canada, has in contemplation \$14,962,300 worth of canal and harbor improvements, etc., for 1923. The following work is planned: Construction on Welland Ship Canal, \$12,200,000; improvements \$100,000; new construction on Trent Canal \$210,000; improvements \$309,000; improving Chambly Canal \$48,000; Lachine Canal \$56,000, and Soulanges Canal \$216,000; new steel gate lifter on Sault Ste. Marie Canal \$5,000; improving Port Arthur and Ft. William harbors \$135,000; St. John Harbor \$860,000; Toronto Harbor \$433,000; Matane Harbor \$100,000; repairs to Chicoutimi Wharf \$29,500; L'Islet Wharf \$25,000; Point aux Trembles Wharf \$30,400; St. Michel de Bellechasse Wharf \$25,000; extending wharf at Grand River \$29,000; new wharves at Grondines \$62,000; Haileyburg \$26,400; breakwaters and piers at Cobourg \$28,600; Port Colborne \$200,000; Toronto Island \$30,000; Whitby \$27,500; new cable for Vancouver Island telegraph and telephone lines \$5,500.

Canadian Pacific Vessels to Make Five Winter Cruises in 1924

ACCORDING to a recent announcement, the Canadian Pacific Railway, instead of chartering its ships during the winter months, will operate them in the following five winter cruises in 1924:

The *Empress of Canada*, of 33,000 tons displacement, 22,000 tons gross, will sail from New York, on January 30, on a cruise around the world. The minimum rate from and to any starting point in the United States, no matter where, will be \$1,600, and for the comfort of passengers the number taken will not exceed 500.

The *Empress of Scotland*, of 35,500 tons displacement, 25,000 gross tons, will leave New York, on January 14, on a cruise to the Mediterranean, Egypt, the Holy Land and Europe. The minimum rate for the round trip, New York to New York, will be \$800, and the number of passengers will be limited to 600 to avoid discomfort.

For the third consecutive year the Canadian Pacific will operate two winter cruises to the West Indies and South America. The *Empress of Britain*, of 22,000 tons displacement, 15,850 gross tons, will leave New York, on January 20 and February 20, 1924, for the West Indies, Nassau, Bermuda, Panama and Venezuela. Each trip will be about 30 days and minimum fare \$250.

The fifth cruise will be called "around America," and will be from Vancouver to New York, via the Panama Canal, the *Empress of Canada* being the ship chosen.

the history of navigation, where modern shipping may be seen in the perspective of its historical development.

Captain Olof Traung, director of the Gothenburg Marine Museum, is in charge of the marine exhibits. In this he has had the able advice and assistance of Admiral Hagg, the grand old man of the Swedish navy, now retired.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPBUILDING AND REPAIRS

Repairs, Norfolk, Va.—The American steamship W. M. Irish was taken to Newport News for repairs.

Propeller, San Francisco, Cal.—The Crowley Shipyard has installed a new propeller on the tug Three Sisters.

Overhauling, Newport News, Va.—The Norwegian steamship Erle is at the Newport News shipyard for repairs.

Yacht Repairs, Jacksonville, Fla.—The yacht Firebird was taken to Merrill-Stevens Drydock Company for repairs.

Repairs to Stern Tube, Cleveland, O.—Steamer Mauna Loa was placed in No. 1 drydock for repairs to her stern tube.

Dump Scows, Oswego, N. Y.—The United States Engineering Corps is having three new dump scows assembled at Oswego, N. Y.

Steamer Drydocked, Buffalo, N. Y.—The steamer Ben Maple has been in the Buffalo drydock for examination and minor repairs.

Overhauling Tug, Jacksonville, Fla.—The tug General R. H. Jackson was awarded to Merrill-Stevens Drydock Company for repairs.

General Overhauling, Oakland, Cal.—The steam schooner Tamalpais has been taken to the Hanlon Shipyard for general overhauling.

Docked for Repairs, Lorain, O.—The steamer George B. Leonard, which wintered at Erie, Pa., will be docked at Lorain for repairs.

Lightship Repairs, Chelsea, Mass.—Boston lightship has been withdrawn and has been taken to Chelsea to undergo necessary repairs.

Miscellaneous Repairs, New Orleans, La.—The U. S. naval cutter Comanche has been taken to New Orleans to undergo miscellaneous repairs.

Repairs Completed, Savannah, Ga.—The Wilkinson Machine Works has completed repairs to the Norwegian motorship Johan Ludwig Mowinckle.

Liner Drydocked, Brooklyn, N. Y.—The American liner St. Paul has been drydocked at the Brooklyn Navy Yard for painting and scraping of the hull.

Inspection and Drydocking, San Francisco, Cal.—The Broad Arrow, of the E. R. Rich & Company, is at the Bethlehem yards for inspection and drydocking.

Battleship Repairs, Charlestown, Mass.—The battleships Delaware, Utah and North Dakota have proceeded to the Charlestown Navy Yard for minor repairs.

Dredge Repairs, Savannah, Ga.—One of the dredges of the Globe Dredging Company has been at the yard of the Wilkinson Machine Company for repairs.

Preparation for Service, Oakland, Cal.—The West Camargo, one of the Government's idle ships, was taken to the Moore shipyard to be prepared for service.

Testing and Inspection, San Francisco, Cal.—The Shipping Board tanker Lio has been placed on the Bethlehem ways for testing of her tanks and for inspection.

New Boiler, Buffalo, N. Y.—Tashenberg Brothers Boiler Works, 45 Illinois street, Buffalo, is building a new boiler for the tug Squaw, owned by James Conlon, Buffalo.

General Repairs, San Francisco, Cal.—The Main Iron Works was awarded the contract for carrying out general repairs on the Pacific Mail liner Venezuela. Price \$574.

Contract Awarded, Oakland, Cal.—The Moore Drydock Company was awarded the contract for general repairs to the Pacific Mail liner President Pierce, with a price of \$16,958.

Low Bidder, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation submitted the lowest bid for repairs to the Shipping Board steamer Bearport, with a price of \$2,085.20.

Annual Inspection, Newport News, Va.—The Old Dominion Transportation Company's steamer Hamilton has been taken to Newport News to be drydocked for annual inspection.

Contract Awarded, Baltimore, Md.—The contract for repairs to the steamer West Cobalt, of the Blake Steamship Company, was awarded to Theodore H. Rohde, Inc., at a price of \$2,215.

Steamer Repairs, Charleston, S. C.—Steamship Cotopaxi, of the Clinchfield Navigation Company, has been taken to the yard of the Charleston Dry Dock & Machine Company for repairs.

Overhauling and Extensive Repairs, San Francisco, Cal.—The steamer Siskiyou recently sailed for San Francisco, leaking badly, where she was to be drydocked for overhauling and extensive repairs.

Propeller Repairs, San Francisco, Cal.—The new Electric Line steamer Cuba has been at the Bethlehem Shipbuilding Corporation's yards for repairs to her propeller, which was found cracked in the hub.

Steamship Launched, Seattle, Wash.—The steamship Alaska, first passenger vessel of more than 200 feet in length to be built on the Pacific Coast, was recently launched from the Todd Shipyards, Seattle.

Steamer Damaged, Buffalo, N. Y.—The steamer Victor, a coal carrier on the Great Lakes, suffered \$1,500 damage in a recent fire in the forecastle. The boat is owned by the Interlake Steamship Company.

Miscellaneous Repairs, Chester, Pa.—To have miscellaneous repairs made, the steamship Persia, of the Merchants & Miners Line, has been drydocked at the Sun Shipbuilding & Dry Dock Company's yards.

Steamers Damaged, Lake Superior.—Steamer William Livingstone and whaleback Frank Rockefeller recently stripped the buckets off their wheels in the ice on Lake Superior, according to reports reaching Buffalo.

Transport Repairs, San Francisco, Cal.—With a price of \$9,338, the United Engineering Works was low bidder for certain repairs on the transport Cambrai, now at the Moore Drydock for cleaning and painting.

Steamship Conversion, Camden, N. J.—The steamship Ashbee is being converted into a motorship at the yards of the New York Shipbuilding Corporation and negotiations are being conducted for the sale of the ship.

Contract Awarded, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was awarded the contract for repairing the Shell Company's oil barge Martinez, damaged in collision. Price \$4,998; six days' time.

Vessel Damaged, Savannah, Ga.—The Coast Guard cutter Yamacraw was in collision with the Isbega in the Savannah River recently. The Isbega was operated by the U. S. Engineers and was considerably damaged.

Turbine Generators, San Francisco, Cal.—With a price of \$7,338, the Bethlehem Shipbuilding Corporation was low bidder for installing larger Westinghouse turbine generators on the Pacific Mail liner President Wilson.

Battleship Overhauling, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been notified that the battleships New York, Idaho, Pennsylvania and Mississippi will be sent to Hunter's Point in July for overhauling.

General Repairs, San Francisco, Cal.—The steam schooner Katherine has been placed on the Bethlehem ways for general repairs. The Daily Freeman has also been taken to the same yard for overhauling and cleaning.

Steamer Repairs, San Francisco, Cal.—With a tender of \$19,599, the General Engineering and Drydock Company, of San Francisco, Cal., was low bidder for extensive repairs to the Shipping Board steamer West Cadron.

Collier Overhauling, Portsmouth, Va.—The collier Proteus is at the Navy yard for the installation of stowage for 26-foot motor boats, installation of strainer boxes for her bilges and recommendations for stowage of gasoline drums.

Wireless, Etc., San Francisco, Cal.—The lumber carrier George L. Olson, of the Oliver L. Olson firm, was taken to the plant of the General Engineering and Drydock Company to have a wireless outfit and new bronze propeller installed.

Reconditioning Vessel, Oakland, Cal.—The Hanlon Shipyard was low bidder for reconditioning the United States Shipping Board steamer Lake Monona with a bid of \$1,896. Work called for being placed in "spot" condition.

Remodeling Steamer, Newport News, Va.—The contract for remodeling the Old Dominion Transportation steamer Hamilton, recently taken over by the Eastern Steamship Lines, has been awarded Southern Shipyard of Newport News.

Haulon Activities, Oakland, Cal.—The Hanlon Shipbuilding Company is making repairs on the barge Rufus E. Wood, steamer Saginaw, steamer Waimea, Havisdale's barge No. 2, the ship Monahela, and barkentine James Johnson.

Schooners Drydocked, San Francisco, Cal.—The lumber schooner Virginia Olson has been taken to Alameda plant of the Bethlehem Corporation and Avalon has been placed on the company's ways in San Francisco, Cal., for general repairs.

Steamer Overhauled, Buffalo, N. Y.—The steamer C. W. Jacobs, owned by the Hammernill Ship Company and operated out of Erie, was placed in the Buffalo drydock, Ganson street, Buffalo, Mo for overhauling and considerable repairs.

Repairs to Steamer, Savannah, Ga.—The Wilkinson Machine Works was awarded the contract for repairs to the river steamer Hildegard, as a result of grounding, at which time she stripped her crankshaft and dislodged the engine from the bed.

Tug Construction, Buffalo, N. Y.—Work is progressing at the Erie Basin yard on the tug built for the Niagara Ferry Company. This vessel is 58 feet long, 16 feet beam and 7 feet hull. It is nearly all plated and should be completed by July.

Miscellaneous Overhauling, San Francisco, Cal.—The Matson steamer Lurline was placed on the ways of the Bethlehem Shipbuilding Corporation to have her crankshaft out for examination, and to be cleaned, painted and have other miscellaneous work done.

General Repairs, San Francisco, Cal.—The contract for general repairs to the Union Oil Company's tanker Uta-carbon was awarded to the Bethlehem Shipbuilding Corporation, the entire hull to be sandblasted as well as alterations made to her piping system.

Cleaning and Painting, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was awarded the work of cleaning and painting the Norwegian motorship Handicap. The same yard has also awarded the general overhauling of the Matson river Enterprise.

Cargo Steamer to Be Built, Buffalo, N. Y.—Cowles Shipyard Company, 31 St. Clair street, Buffalo, will build a power cargo steamer for the Erie Canal, dimensions to be 105 feet long, 22 feet beam and 12 feet hull. Work will be started in July.

three weeks and it is expected that the vessel will be finished by September. It will be put into service by the Cowles Towing Company, of Buffalo.

Bids for Dories, Staten Island, N. Y.—The Superintendent of Lighthouses, Tompkinsville, Staten Island, N. Y., received sealed proposals on May 28 for the construction and delivery of three fishermen's dories, each to have a length overall of 20 feet and furnished complete.

Schooner Reconditioning, Brooklyn, N. Y.—What is said to be one of the last iron hulled clipper type vessels turned out by the famous shipbuilding firm of R. Steele & Company, the Norwegian schooner Sophie, of 1,753 tons, is to be reconditioned at the Morse Drydock Company's plant.

Tug Overhauled, Buffalo, N. Y.—The tug Globe, owned by the Seaboard Forwarding Company, is being overhauled and repaired at the Erie Basin Shipyard, 114 River street, Buffalo. Some new decks are being built and repairs will be made to the engine, boiler and other machinery.

Drydocking and General Repairs, Oakland, Cal.—The Moore Drydock Company, of Oakland, was awarded the contract for drydocking and general repairs to the United States Shipping Board steamer Jewey, at a price of \$2,224.55. The other bids were: Hanlon's, \$2,286.85, and Bethlehem, \$2,335.85.

Voyage Repairs, Oakland, Cal.—The Moore Drydock Company received the contract for voyage repairs to the Pacific Mail liner President Lincoln, at a price of \$6,464. Alterations of the fire mains from the B deck of the President Lincoln were also awarded to the Moore Company, on a tender of \$50.

Engine Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Company has been awarded the contract for repairing the port engine of the British motorship Marinula of the Shell Oil Company. This repair job is said to be the largest Diesel engine repair job that has ever been carried out on the Pacific coast.

Vessels Drydocked, Buffalo, N. Y.—The Buffalo Drydock Company, Ganson street, Buffalo, has been awarded the following work: Repairs to Barge Vincent Bird, recently damaged in collision; and the steamer Juniata, of the Great Lakes Transit Company, work of painting and replacing main bearings.

Barges Damaged, Buffalo, N. Y.—The canal barge Isula, owned by the Superior Transportation Company, of Buffalo, was rammed and sunk on May 15 by the steel freighter M. A. Bradley, managed by Harvey H. Brown & Company, Cleveland, Ohio. The incident occurred in the Buffalo River. The canal barge Bird was also damaged.

Sale of Floating Equipment, Brooklyn, N. Y.—Sealed bids were received in the office of the Eastern Surplus Property Control Officer, Army Supply Base, Brooklyn, N. Y., on April 23 for the purchase of floating equipment, including freight and passenger steamers, speed boats, mine yawls, launches, etc.

Reconditioning Steamer, Oakland, Cal.—At the closing of bids for the work of making changes and repairs on the steamer Waimea, formerly the City Tokopa, which was recently purchased by the Los Angeles Steamship Company from the Inter-Island Steam Navigation Company, the Hanlon Shipbuilding Company, of Oakland, Cal., was low.

Shipyard Activities, Buffalo, N. Y.—A second dry steamer, 58 feet long, 8 feet hull and 17 feet beam, has been ordered from the Erie Basin Shipyard, Buffalo, by the Grand Island Ferry Company. Work has been started. The same yard is repairing a boiler in the tug Wing, giving a general overhauling to the tug Globe and placing a new boiler in the tug Clark.

Contract Awarded, San Francisco, Cal.—The contract for the construction of a modern tank steamer, to be equipped with twin Diesel engines driven by an electric generator furnishing 800 horsepower and to be 210 feet long and 40 feet beam, to be kept in service in either the Atlantic or Pacific Ocean, has been awarded to the Bethlehem Shipbuilding Corporation by the Standard Oil Company of California.

Shipyard Activities, Mobile, Ala.—The Alabama Drydock and Shipbuilding Company, Mobile, has received the following contracts: Union Oil Company's steamer Habira for examination, cleaning and painting; Coast Guard cutter Tallapoosa, scrap-iron painting and overhauling; Gulf Refining Company's tug E. L. Russel, rudder repairs; and the

Gulf Refining Company's barge Ohio, cleaning, painting and rudder job.

Voyage Repairs, San Francisco, Cal.—The General Engineering and Drydock Company, San Francisco, was awarded the contract for voyage repairs to the United States army transport Thomas, the bids being as follows: General Engineering, \$1,563; Main Iron Works, \$1,809; Moore's, \$1,832; Columbia Machine Works, \$1,842; Bethlehem, \$2,050; United Engineering, \$2,162; Smith & Scanlon, \$2,445, and Hanlon Shipbuilding Co., \$2,498.

Shipyard Activities, Mobile, Ala.—The Alabama Drydock and Shipbuilding Company was awarded the following contracts: Shipping Board tanker Derbyline, for examination, tail shaft drawn, hull, masts, etc., painted; river steamer Volcano, rudder repairs and engine room work; Shipping Board steamer Portola Plumas (now Pure Oil Company's steamer W. E. Hutton) extensive repairs; and minor repairs to the steamship Jacob Luckenbach.

Steamer Overhauling, Buffalo, N. Y.—The Buffalo Drydock, Ganson street, Buffalo, has placed a new stem and twelve plates on the steamer Harry Yates, recently damaged by ramming a concrete pier in the harbor. The same company has put a new wheel on the steamer Mapleboro, damaged in Lake Erie, by ice, and has been awarded the contract for repairing the steamship Niagara, which broke her wheel and rudder by striking against a bank in the Welland Canal.

Destroyers, Etc., Overhauled, Norfolk, Va.—Five destroyers, Isherwood, Zreck, Lardner, Toucey and Case, are at the Norfolk Navy Yard for overhauling. Another vessel of the division is due shortly, while another division is scheduled to arrive about the middle of May for the same purpose. The minesweepers Contocook, Rail and Robin, and the supply ships Vestal, Vireo and Trogeus have been assigned by the Navy Department to follow to Hampton Roads for repairs also.

Reconditioning, Portsmouth, Va.—The Navy cargo ship Capella, which is reported at the Canal Zone on her trip from the West Coast to the Atlantic, will go to the Navy yard for work which will include investigation as to installation of waterway along the boat deck and moving the after bulkhead of the wardroom passage aft, so as to enlarge the wardroom pantry. There will also be recommendation made for installing suitable davits for dinghy on the poop deck. The pitch of the Capella's propeller will be checked.

Ferry Launched, Pittsburgh, Pa.—The largest boat ever built on the Ohio River, the George H. Walker, was recently launched from the ways of the Dravo Construction Company at Pittsburgh. The new ferry is of steel construction, 340 feet long with 91.6 feet beam, and is for the Gulf Coast Lines to be operated as a ferry between Baton Rouge and Anchorage. It will be propelled by two independently operated side wheels of thirty-one feet diameter. Operation of the boat will be directed from the pilot house by a mechanical telegraph system in place of the usual river system of bells and gongs.

Bids Asked for Motor Tugs, Philadelphia, Pa.—The motor tugs for which the United States Engineer Office, Philadelphia, will open sealed proposals at noon, Eastern Standard time, on June 22, are to have an overall length of 53 feet 3 inches, beam 14 feet 1½ inches and displacement 41 tons. The engines are to be of the multiple cylinder, vertical, two or four stroke cycle, single acting, heavy duty, marine type, capable of operating on kerosene and on fuel oils of not less than 24 degrees Baumé gravity, to be the product of an American manufacturer and of not less than 90 brake horsepower. Two of the tugs are to be delivered at Philadelphia, one at Kewaunee, Wis., and one at Chicago, Ill.

Boiler and Tank Work, Portland, Ore.—Sealed proposals were received by United States Engineer Office, 321 Custom House, Portland, Ore., on May 28, for the carrying out of boiler and tank work on United States dredge Clatsop. Principal work to be done under the specifications consists of furnishing the labor and necessary material and removing two Scotch marine boilers, and in their stead install, ready for operation, two watertube boilers to be furnished by the government; construct and install, ready for operation, two oil tanks about 5 feet diameter by 24 feet long, and two oil tanks about 4 feet by 6 feet by 13 feet; make water tanks, ready for use, out of a portion of the two aft coal bunkers and cut two hatches in the main deck each side of the engine room house, providing a hatch cover for each. Each of the furnaces is to be provided with five Coen mechanical oil burners, the registers and burners to be furnished by the government and installed by the contractor.

SHIPYARDS AND DRYDOCKS

Floating Dock, Vancouver, B. C.—Final arrangements have been made for the construction of the 15,000 ton floating drydock to be built at Vancouver, B. C., for the Wallace Dry Dock Company of that port, constructed from designs prepared by W. T. Donnelly, of 17 Battery place, New York. The dock, of wood pontoon and steel wings, will be able to handle a vessel of 575 feet and will have 98 feet in the clear. It will be built in two sections and will be ready in about six months. The Wallace Dry Dock Company will invest approximately \$1,250,000 in the building project, including besides the dock a 700-foot pier, large machine shop, plate shop, blacksmith shop and power house.

Shipyard to Be Sold, Tampa, Fla.—The largest shipyard in Florida, the Oscar Daniel Shipyard, is to be sold at public auction June 6, 7 and 8, by the Industrial Plants Corporation, of New York. The sale will include all of the machinery, steel, equipment, supplies, ship chandlery, pipe, locomotive, trains, flat cars, rail, etc., located at the yard. The Oscar Daniel Shipyard was built in 1918-1919, at a cost of over \$1,000,000, for the building of steel ships of the 10,000-ton class. Machinery and equipment are of the latest, most modern type. Included in this sale will be offered about 1,000 tons of new steel plates and angles. Persons planning to attend this auction sale should communicate with Frederick R. Shore, of the Industrial Plants Corporation, who has made special arrangements with the Seaboard Air Line Railway for special accommodations for such people.

NEW INCORPORATIONS

The Baltimore Steamship Company has increased its capital from \$550,000 to \$2,150,000.

The Argonne Steamship Company of Manhattan has filed dissolution papers at Albany.

Steamship Terminal Operating Corporation, capital \$100,000, chartered under Delaware laws.

Atlantic Marine & Shipyards Corporation of Wilmington, Del., capital \$100,000, chartered under Delaware laws.

The Cape Steamship Company, capital \$5,000,000, chartered under Delaware laws. Incorporators: A. C. Harvey, J. M. Lee and A. L. Goodman, of Columbus, Ohio.

McGovern Plumb Salvage Corporation, capital \$25,000, chartered in Delaware, to own ships and salvage boats. Incorporators: E. R. Brause and E. Levinson, of New York.

PORT IMPROVEMENTS

Wharf, Sturgeon Falls, Ont.—Department of Public Works, Ottawa, plans new wharf at Sturgeon Falls. \$30,000. K. M. Cameron, acting chief engineer.

Harbor Development, Florida.—Allotment for improvement on river and harbor projects announced by the War Department includes \$15,000 for Charlotte Harbor, Fla.

Wharf, Haileybury, Ont.—The Department of Public Works, Ottawa, plans to rebuild wharf destroyed by fire last year. \$26,400. K. M. Cameron, acting chief engineer.

Docks, North Tonawanda, N. Y.—Tonawanda Iron Works, care American Radiator Company, Elmwood avenue, Buffalo, plans docks along Niagara River. To exceed \$50,000. A. A. Landon, president.

Wharf, Blind River, Ont.—Sealed proposals were received at the office of R. C. Desrochers, Secretary of the Department of Public Works, Ottawa, May 22, for reconstructing superstructure of timber wharf.

Revetment Wall and Dock, Hamilton, Ont.—City Council and Harbor Board plan revetment wall and dock at foot of Ottawa street, concrete and earth fill with 2,000-foot boat slip. \$400,000. W. F. McFaul, city engineer. W. Ainslee, 47½ Main street, E., chairman, Harbor Board.

Contract Awarded, Philadelphia, Pa.—The Department of Wharves, Philadelphia, has awarded the contract for the construction of a steel barge with a capacity of 100,000 gallons to the Clinton Shipbuilding Company.

Dredging Operations, Norfolk, Va.—The Calkins Dredging Company, of Norfolk, has started dredging operations in Paradise Creek just south of the Navy Yard annex. The channel will be given depth to accommodate seagoing vessels.

Paint, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Orleans Court Building, on May 31, for furnishing 1,250 gallons of yellow paint. Requisition SK-1240.

Repairs to Piers and Bulkheads, Hoboken, N. J.—The Robins-Ripley Company has been awarded the contract for repairing all the piers and bulkheads of the United States Lines in Hoboken. This work is already under way and rapidly progressing.

Grain Elevator, Winnipeg, Man.—N. Bawlf Terminal Elevator Company, Grain Exchange Building, awarded the contract for a reinforced-concrete grain elevator, 1,500,000 bushels, to Carter-Halls & Aldinger, Union Bank Building, at a price of \$750,000.

Dikes and Dredging Channel, Brooklyn, N. Y.—Bids were received May 21 by J. H. Delaney, Commissioner of Docks, Pier "A," foot of Battery Place, North River, New York, for dikes and dredging channel between Mill Basin and Paerdegat Basin, Jamaica Bay, Brooklyn, N. Y. Contract 1797.

Wharf Escalators, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans at their office, Suite 200, New Orleans Court Building, until 3 P. M., May 31, for furnishing portable escalators, for use at the Public Cotton Warehouse Wharf. Requisition E. D. 13428.

Creosoted Timber, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, on May 31, for furnishing approximately 85,000 feet (board measure) creosoted timber, and 195 creosoted piles 50 feet long, as per Dock Board specifications. Requisitions ED-13505 and ED-13506.

Reconstructing Shed, New Orleans, La.—The Board of Commissioners of the Port of New Orleans received sealed proposals on May 31 for the reconstruction of the Celeste Street Shed, comprising tearing down and re-erecting riverside portion, raising land side portion, connecting to Market Street Shed and painting. Requisition ED-13470.

Hydraulic Work, Iowa.—Sealed proposals were received at the office of the Secretary, Mississippi River Commission, 1311 International Life Building, St. Louis, Mo., until 11 A. M., May 21, for constructing about 300,000 cubic yards of earthwork by the hydraulic method in the Louisa County Levee District No. 15, Iowa. Further information on application.

Levee Work, Iowa River.—Sealed proposals were received at the office of the Secretary, Mississippi River Commission, 1311 International Life Building, St. Louis, Mo., until 11 A. M., May 21, for constructing about 645,000 cubic yards of earthwork by the hydraulic method in the Iowa River-Flint Creek Levee District No. 16, Iowa. Further information on application.

Contract Awarded, Baltimore, Md.—The foundation dredging contract for the McComas Pier has been let jointly to the Rundel Corporation and the Sanford Brooks Company, of Baltimore. Dredging consisting of 770,000 cubic yards of mud at 19.9 cents per yard; sand and gravel, 550,000 cubic yards at 27.5 cents per yard. The sand and gravel taken from the Patapsco Terminal is to be used as a foundation on the bulkhead line at the McComas Terminal and the mud taken from the McComas Terminal is to be used as fill in small creek abreast of Thomas Cove in the harbor.

GOVERNMENT WORK

Dredging, Green Bay, Wis.—Sealed proposals were received by U. S. Engineer, Milwaukee, Wis., until 3 p. m., May 31, for dredging at Green Bay, Wis. Further information on application.

Retaining Wall and Concrete Culverts, Fergus, Ont.—Wellington Company is having plans prepared for several reinforced-concrete culverts and retain-

ing wall; \$50,000. A. W. Connor, 34 Victoria street, Toronto, engineer.

Dredging, Duck Island, Conn.—Sealed proposals were received by U. S. Engineer, Providence, R. I., until 12 m., eastern standard time, May 31, for dredging in Duck Island Harbor, Conn. Further information on application.

Dock, Milwaukee, Wis.—The Sewerage Commission, 508 Market street, awarded the contract for 1,338-foot pile and concrete dock around west end of sewage disposal plant, to W. W. Whitney, 216 West Water street, at \$138,768.

Motor-Launch Hull, Vicksburg, Miss.—Bids were received by the Mississippi River Commission, Third District, P. O. Box 404, Vicksburg, until 11 a. m., May 22, for furnishing one steel motor-launch hull. Further information on application.

Jetty Construction, Mississippi River.—U. S. Engineer Office, 329 Custom House, New Orleans, received sealed proposals until 9 a. m., June 1, for jetty construction at South Pass, Mississippi River. Further information on application.

Training Wall, Etc., Richmond Harbor, Cal.—Sealed proposals were received by U. S. Engineer Office, San Francisco, Cal., until 11 a. m., June 1, for dredging and building training wall in Richmond Harbor, Cal. Further information on application.

Retaining Walls, Freehold, N. J.—Sealed bids were received until May 16 by the Board of Freeholders, Monmouth County, for reinforced-concrete retaining walls at Bridge W-43 between Avon and Belmar. G. K. Allen, Jr., 60 Broad street, Red Bank, engineer.

Dredging and Pier Removal, Calumet River, Ill.—Sealed proposals will be received at the United States Engineer Office, 537 South Dearborn street, Chicago, Ill., for dredging and pier removal in Calumet Harbor and River, Ill. and Ind. Further information on application.

Dredging, Los Angeles, Cal.—Proposals were received at the office of the U. S. Engineer, Central Building, until May 18, for dredging in Los Angeles Harbor. Area 3—1,270,000 cubic yards with maximum allowable over-depth 36,000 cubic yards; Area 4—610,000 cubic yards, over-depth allowance 20,000 cubic yards; Area 5—\$20,000 cubic yards, over-depth allowance 24,000 cubic yards; Area 6—200,000 cubic yards, over-depth allowance 20,000 cubic yards.

Contract Awarded, New York.—Power Corporation of New York, Northern New York Trust Company Building, Watertown, awarded the contract for 12,500 cubic yards earth and 3,000 cubic yards rock excavation, 8,500 cubic yards of earth embankment, also reinforced-concrete power house and 800-foot concrete dam, 65 feet high, 20,000 cubic yards concrete, at Flat Rock site, on Oswegatchie River, to Burns Brothers & Haley, Inc., Bank Building, Watertown, \$800,000.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York
President—E. A. Simmons.
Secretary—K. W. Heinrich.

The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irving G. Keller.

Port of New York Authority

11 Broadway, New York
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vt. St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave. Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter.

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morris
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-T.

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

July, 1923

No. 7

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY

30 Church Street, New York

F. B. WEBSTER, Editor
H. H. BROWN, Managing Editor

L. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

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MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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The American Marine Congress

THE Marine Congress that is to be held in New York City during American Marine Week deserves and should receive the hearty support of every organization, concern and individual having to do with American ships and shipping. It is the first real attempt that has ever been made in the marine field to bring together not only those who make a living out of the industry but also all commercial, manufacturing and farming organizations, concerns and individuals interested in water transportation.

America will never have a really great merchant marine until the importance of that industry to the welfare and progress of the country is thoroughly understood. In the past a lot of educational work has been done by various organizations; but no attempt has heretofore been made to get everybody around one table for a frank discussion of the subject. It is just that, that the American Marine Association had in mind when it formulated its plans for the Congress in November. It has succeeded in building committees composed of men best qualified to represent the several interests concerned; and the movement has the backing of the Hon. Herbert C. Hoover, Secretary of Commerce, who has been outspoken in his belief that the proposed Congress will do much to effect a better understanding of the necessity for an American merchant marine.

We bespeak for this Congress the support that these industries as a whole can give when once convinced that the purpose is right.

Why Government Ownership?

WHILE the question of Government ownership and operation of Shipping Board vessels had not been determined at the time this issue of MARINE ENGINEERING AND SHIPPING AGE went to press, nevertheless that course was threatened to the extent that a committee of three members of the board had been appointed to formulate a workable plan.

First, let us make it clear that we do not believe in either Government ownership or Government operation as against private ownership and private operation in any industry. The reasons are too well known to warrant discussion here. For results in a field closely parallel to the marine field, we have but to point to the consistent failures in the railway field in all of those countries of the world that have tried it, including our own experience in the last war. President Harding in his speech at Kansas City on June 22 said, on the question of possible Government ownership of railways: "In the present state of the public treasury and of tax burdens, and in the light of recent sad experience with Government management, this is not to be considered. I believe it would be politically, socially and economically disastrous."

With the marine field, however, there is the added and very important difference that while with the railways the question is national, with ships, other than those in coast-wise traffic, it is international. There, successful operation means profitable return cargoes; and ability to get profitable cargoes from foreign countries means a flexible organization capable of securing the business and making rates and changing destinations at a moment's notice—something absolutely impossible under Government ownership, notwithstanding that at least one member of the Shipping Board has stated, in connection with cargo vessels, that the Government would keep surplus ships in various ports ready for instant loading and would quote rates sufficiently low to meet any competitor.

Now, what is the Government's plan insofar as it has progressed? The Shipping Board has seven members; and at the moment there are seven different opinions as to the course to be followed. Out of the confusion of opinions looms a scheme involving the formation of some eighteen different companies. If eighteen "companies" means that many corporate entities, the present loss of some fifty millions of dollars a year would soon be multiplied several times and in fact would probably be multiplied at least twice under any plan that may be evolved, because experience has

taught us that no Government can operate any business at anything other than an imaginary profit; that if the loss is now fifty millions of dollars a year with a number of ships being operated by private corporations, the loss under full Government operation would be far greater on a like accounting basis.

But if the Shipping Board is determined to go ahead, why the very considerable additional executive overhead and red-tape incident to eighteen separate corporations? Why the added burden on the taxpayer when it is possible by concentration of routes and a departmental organization to carry on with one corporation? There is plenty of precedent in the business world for the manipulation of numerous units by one corporate body with one board of directors and one executive head, the scattered units being but departments of the whole.

We have said that within the Shipping Board there are seven different opinions as to how the threat of Government ownership and operation should be carried out. There is a still further complication than that for substantially all of them either do not favor Government ownership or are opposed to that course. This is especially significant in view of the fact that all are political appointees and might be expected to line up on the other side of the fence. In any event, because of those differences and the attitude of the country generally toward Government ownership and operation; because of the slogan of the present administration—"less Government in business, more business in Government"—which has been so well reflected in the work of some departments at Washington, especially the Department of Commerce; and because of the very serious effect Government ownership and operation on the seas will have on the American merchant marine as a whole, why not a renewed effort to find a way out of the present dilemma?

First, scrap all ships which cannot possibly be sold because unfit for profitable operation. They are in any event as much of a menace to the progress of the American merchant marine as are derelicts to navigation. Then sell all of the others to private owners either after first installing Diesel engines and in other ways refitting for competitive business such of the vessels as would be amenable to that treatment, or else authorizing the purchaser to do so, the job to be financed by the Government. With that determined, the question of price only would be left; and while not an easy nut to crack, it is far from being insurmountable. Some routes and vessels could be sold outright at predetermined figures. As to the others, an equitable course should not and would not be hard, if approached from both sides in the right spirit. The Government could well afford to make contracts for the operation of routes and ships on a specified income or interest and time payment basis, the ultimate purchase price to be determined by the results from operation for a given period. Perhaps prospective purchasers should be asked to pay a fixed minimum in cash at the start, the excess to be determined in the manner suggested. At any rate, the result would be the elimination of a Government expense of at least fifty millions of dollars a year and the return to the Treasury of some part of the cost of the ships, at the same time giving new life and increased determination to the American merchant marine as a whole

and a new hope to that great industry which has to do with building, repairing and equipping ships and which is now suffering unnecessarily because of the present chaos, in which the Government is playing so important a part.

"Squandering Good Will Abroad"

ONE of the best arguments for an American merchant marine is that our own ships would assure our farmers and manufacturers of a regular and reliable source of delivery of their products to foreign markets without transshipment. But such is the perversity of this God-favored nation, that the minute anything approaching boom times appears, the producers forget that foreign trade is absolutely essential "to level out the valleys of periodic depression in business cycles and to keep their factories and farms steadily employed."

In a recent article Mr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce said, "an old abuse, so costly in the past to American prestige abroad, is again creeping into our export trade. Under the allurements of domestic boom conditions many of our manufacturers are showing increasing apathy to the legitimate requests and orders of foreign contacts whose patronage they so carefully solicited during the past few years. The sound policy of definite allotments for export is being ignored in far too many cases. Unless this disloyalty to firmly establish foreign contacts is promptly overcome, American commercial prestige and good will abroad are likely to suffer serious damage."

According to Mr. Klein, "a number of British firms who are representatives of American manufacturing exporters are sick and tired of the foreign trade flirtations of their American connections whose export interest shifts with every vibration of domestic demands." It takes years of patience and hard work to build up a foreign business and, if the results of all the efforts that have been made to obtain an outlet for our surplusage are to be thrown away because our manufacturers are temporarily having trouble in supplying the domestic demand, then it is a situation that affects not only the merchant marine but every citizen in the country. This is a matter that should receive the serious attention of our commercial organizations.

Insurance Tax Vetoed

EFFECTIVE pressure was brought to bear upon Governor Smith by powerful insurance brokerage interests who urged that the Sheridan Act would prove a serious injustice to shippers in this country who find it impossible to secure full coverage here, and the Governor vetoed the bill. This was Senate bill 1690, printed number 2289, entitled "An act to amend the tax law and to impose a tax upon residents of the State and upon persons transacting business therein, insured against loss of property by insurers not authorized to transact business in the State." In his memorandum accompanying the veto the Governor gave, as his reasons for withholding approval, a belief that when New York companies are unable to write the insurance there should be no penalty attaching to the insured for seeking protection to his property elsewhere. It was brought out at

the hearing that when the United American Line recently sought four million dollars' coverage on specie shipped abroad it was unable to secure more than a small portion of the insurance in New York State. Under the provisions of the proposed bill a tax would run to the insured of 25 percent on the insurance written with companies not authorized to transact business in this State. "This," said the Governor, "is not the time to handicap men who are endeavoring to build up an American merchant marine; nor is it the time to add to the cost of doing business in this State, and particularly at the Port of New York."

Grain Bulk Carriers

DURING the last six months no less than twelve Italian steamers have been lost in the grain bulk carrying trade. Underwriters are trying to find out whether this series of disasters is attributable to the type of vessels or to their nationality. Once grain starts to shift, unless the vessel is small enough to admit of manual labor correcting the situation, the case is next to hopeless. A list at once begins and the grain flows like water to increase it. Foundering is almost certain to result. And there is subsequent trouble over the insurance, because the reason for the disaster did not lie with a peril of the sea but in the inherent nature of the cargo.

Combined Riveting and Welding

IN converting the battleship *Kearsarge* into a seagoing crane-ship with a lifting capacity of 250 tons, the whole ship structure had to be materially reinforced in order to take care of the stresses imposed by the presence of the crane and the possible loads that might be placed on her decks. As pointed out in a full description of this crane-ship appearing in the June issue of *Mechanical Engineering*, the official organ of the American Society of Mechanical Engineers, it was even thought necessary to reinforce the riveted joints in some of the strength members by welding. So the main deck, which is composed of three thicknesses of plating, was, in addition to its riveted connections, electrically butt welded throughout the top strake thus making that member practically one piece of metal. Likewise, it is stated that it was found difficult to select angle irons for connecting the strength bulkheads to the under side of the deck that would have sufficient metal left after the necessary rivet holes had been drilled. It was decided that this problem could be solved by welding the toes of the double bounding angles to the bulkheads for the purpose of taking a large portion of the shear stress off the rivets.

The performance of this crane-ship will be watched with interest for many reasons. It is the only sea-going crane-ship and, at the same time, the largest floating crane in existence. It has already actually lifted 312 tons and may be called upon to lift an even greater weight. The size of the structure has called for a design that exceeds well tested limits. But has it in dealing with stresses of unprecedented magnitude solved the problem of the most efficient joint? In the condition where there is not enough metal left in a plate, or enough plate and not enough rivets be solved by

additional welding? Will a combination of riveting and welding work in unison or will the weld which unites the metal in one piece take the entire load and the elastic limit of the joint be reached before the rivets begin to work? If riveting can not be depended upon for such a connection why not make an entirely welded joint?

The Hull Slump

UNDERWRITERS have had ample opportunity for reviewing the unusual conditions of the past two years, and they are now in position to reflect intelligently upon the circumstances that have militated so seriously against them in an attempt to secure a modicum of profit in writing hulls. The war caused the first great upset, but this was scarcely worse than the astonishing boom in shipping and its subsequent slump. An outstanding feature of underwriting in this period has been the enormous loss of money paid out for "return premiums." This was occasioned by the violent fluctuation in shipping values, which necessitated rearrangements in insurances, sometimes repeatedly during the year. Policies were frequently cancelled after only a month or so had run off, the premium for the balance of the twelve months being returned, generally with a "short period" rate adjustment amounting to 20 percent in reduction. These insurances would be renewed, but always on a substantially reduced valuation. In many instances the underwriters returned more premium for the unexpired period of the old policy than they received for the twelve months of the new.

A North Pole Risk

NOW and again the underwriter is called upon to extend his protection to adventures that tax his ingenuity as regards an approximation of the measurement of hazards involved. But to the experienced insurer there is nothing that can not be written, and with a fighting chance at a profit. Thus, there has been recently placed in the New York market the insurance on the yacht *Bowdoin* which Dr. Donald B. MacMillan is to use on his projected trip to the North Pole. The value of the vessel is \$30,000, and as she was built expressly for Arctic work it is likely that the Doctor is not far from the mark in esteeming her the strongest little craft in the world. The voyage is planned to run from Wiscasset, Me., along the Labrador coast and thence northeast to Greenland, following the Greenland coast northward for a wintering in Ellesmere Land. That is where the underwriter's worries begin—for "wintering" in the Arctic means being frozen in. There the *Bowdoin* will lie, snug and tight, serving as a headquarters while the expedition is pushed northward over the ice.

What do they expect the underwriters to do? Insure the vessel for the round trip, including the period of being frozen in, against the risks of total and/or constructive total loss and general average and salvage charges. In the judgment of the insurers this was scarcely an undertaking exactly within their sphere; but as it was an American enterprise and for laudable purpose, they did not hesitate to participate. The entire risk was placed in the New York market at a rate of 12½ percent.



Officials and Guests on the L

Leviathan on Trial Trip Breaks World Records

**687 Miles in 25 Hours at Average Speed of
27.48 Knots — 28.04 Knots in One Hour**

By Harold F. Lane*

ALL established world records for sustained speed by an ocean liner, as well as the speed record for one hour, were broken by the *Leviathan*, reconditioned at the Newport News Shipbuilding and Dry Dock Company on the return run of its trial trip, made from Boston to Abaco in the Bahamas and back to New York, June 19 to 24, under the command of Captain Herbert Hartley, and under the supervision of Gibbs Brothers, Inc., who have had general charge of the reconditioning and the trial trip for the Shipping Board.

After leaving Boston under somewhat of a cloud of ignorant and partisan or malicious criticism and, it is reported, with some fear on the part of Shipping Board officials that an effort would be made at the last minute to stop the trip by injunction as an unnecessary "joy ride," the big ship came back with the broom at its masthead and the passengers filled with new enthusiasm for a successful American merchant marine which the enormous amount of publicity the trip received helped to spread among the public.

During the 25-hour period from 7:17 A. M. on June 22 to 8:17 A. M. on June 23 the *Leviathan* made a distance of 687 nautical miles, from Jupiter Light, off the coast of Florida, to a point approximately off Norfolk, Va., at an average speed of 27.48 knots. For the first hour of that period the average speed was 28.04 knots and for 6 hours of the time the average was over 28 knots, while for 12 hours the average was 27.94 knots.

The distance run for the 25-hour period is 11 miles more than the best record ever made by an ocean liner, that of

the *Mauretania*, which, on January 25 and 26, 1911, made 676 miles in 25 hours at an average speed of 27.04 knots. The highest speed made by the *Leviathan* for an hour also exceeds the fastest speed of the *Mauretania* by approximately half a knot.

CREDIT GIVEN TO PRESIDENT HARDING'S ENCOURAGEMENT

Albert D. Lasker, who retired as chairman of the Shipping Board on the day of the start of the trial trip, sent a radiogram to President Harding informing him of the accomplishment immediately upon the announcement of the record made by the *Leviathan*, which, he said, was reconditioned through the constant encouragement the President has always given the merchant marine. "Thus, through its first big ship, in its first trial run, America has the largest, the finest and the fastest ship in the world," Mr. Lasker said. "an inspiring premier ship to our merchant marine. May this performance enthuse our people as it should and be some return to you for your constant interest in and enthusiasm for America on the seas. It is an historic tribute to the genius of those who redesigned and rebuilt the *Leviathan* champion of the seas, her officers and crew."

ROUTE OF THE TRIAL TRIP

The trial trip was from Boston to Abaco Island, then through Providence Channel and northward in the regular northbound steamer track, via Jupiter Light and Diamond Shoals to New York, a total of 2,209 miles.

On June 18 the ship was taken, partly under tow and partly under its own power, to a point just outside Boston Harbor where the start was made at 3:20 P. M. on June 19. From Boston Light Vessel anchorage it was the intention

* Our Washington correspondent.



ing Her Trial Trip, June 19 to 24

to maintain the engines at approximately 150 revolutions per minute for a 12-hour period but early in the evening an unusually dense fog set in which remained throughout the night and it was necessary to reduce the speed from 18

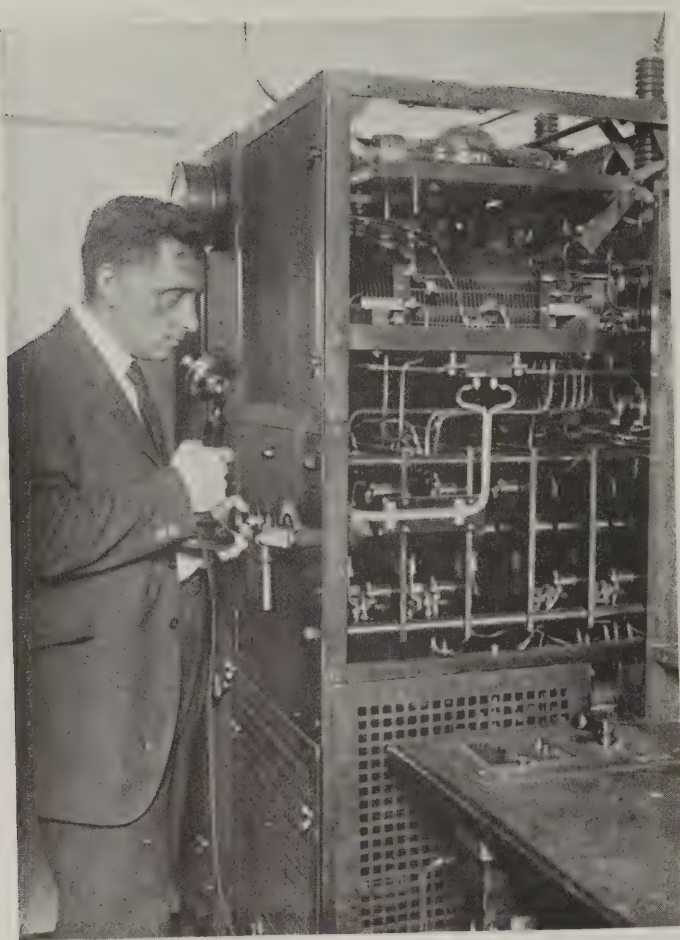
to 8 or 9 knots. On June 20 and 21 the revolutions were gradually increased for 10 and 12-hour periods to 160, 170, 175 and 180 per minute and the speed increased to about $23\frac{1}{2}$ knots. From noon of June 20 to noon of June 21 the



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Congressman Martin B. Madden, of Illinois, Gets Some
Figures from Mr. Lasker



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Mr. Lasker and Senator Fletcher, of Florida, Have a Friendly
Discussion



Photograph by Kadel & Herbert, N. Y.

J. R. Irwin, First Radio Operator of the Leviathan, Who During the Trial Trip Handled Nearly 7,000 Words in 6½ Hours Without Relief

average speed was 22.1 knots and the distance covered was 530 miles. Abaco Light was passed about midnight on June 21 and the passage through Providence channel made during the night.

The high-speed test was begun when Jupiter Light was passed at 7:17 and on June 22 when the revolutions were increased to the maximum and shortly after 10:00 A. M., a bulletin signed by Staff Commander H. C. Fish announced that up to that time the ship had made 75.7 miles at an average speed of 28.04 knots.

At noon of June 22 the distance from Jupiter was 132 miles, the average speed was still 28.04 knots and the ship was approximately off Daytona, Fla., having made 590 miles in the 24 hours. Succeeding bulletins issued by Staff Commander Fish or Captain Hartley gave the distances and average speed from Jupiter as follows:

2:00 P. M.	188 miles	28 knots
4:00 P. M.	243 miles	28 knots
6:00 P. M.	300.6 miles	28.1 knots
8:00 P. M.	355 miles	27.94 knots
10:00 P. M.	411 miles	27.96 knots
8:17 A. M.	687 miles	27.48 knots
12:00 M. June 22 to 12:00 M. June 23, 595 miles, 25.2 knots		

LOG OF THE RECORD-BREAKING TRIP

Later there was printed on board and issued to the guests the abstract of the log printed on this page.

Only a few minutes after the completion of the 25-hour run, the ship then being off the Chesapeake Capes, a fog set in which made it necessary to run very slowly until after noon and at one time to stop entirely upon a signal from another vessel close ahead. The fog continued throughout

TRIAL TRIP JUNE 18TH TO JUNE 24TH, 1923

Date	Hour	Lat. N.	Long. W.	Miles	Remarks
June 18	12.58 A.M.				Left Commonwealth Dry Dock.
	3.59 P.M.				Anchored off Boston Light Vessel.
June 19	3.20 P.M.				Hove up anchor and proceeded to sea.
June 20	12.00 noon	38.09	70.26	300	Dense fog throughout night. Steamed at reduced speed. Smooth sea. Ave. speed 14.6.
June 21	12.00 noon	30.08	74.50	530	Fine and clear weather. Small sea. Average speed 22.1.
June 22	12.00 noon	29.09	79.40	590	Fine and clear weather. Smooth sea. Average speed 24.58.
June 23	12.00 noon	37.31	74.08	595	Morning watch ran into dense fog. Steamed at reduced speed. Average speed 25.2.
June 24	4.47 A.M.			194	Arrived Ambrose Light vessel in thick fog. Steamed at reduced speed. Ave. speed 11.6.

Total distance 2,209

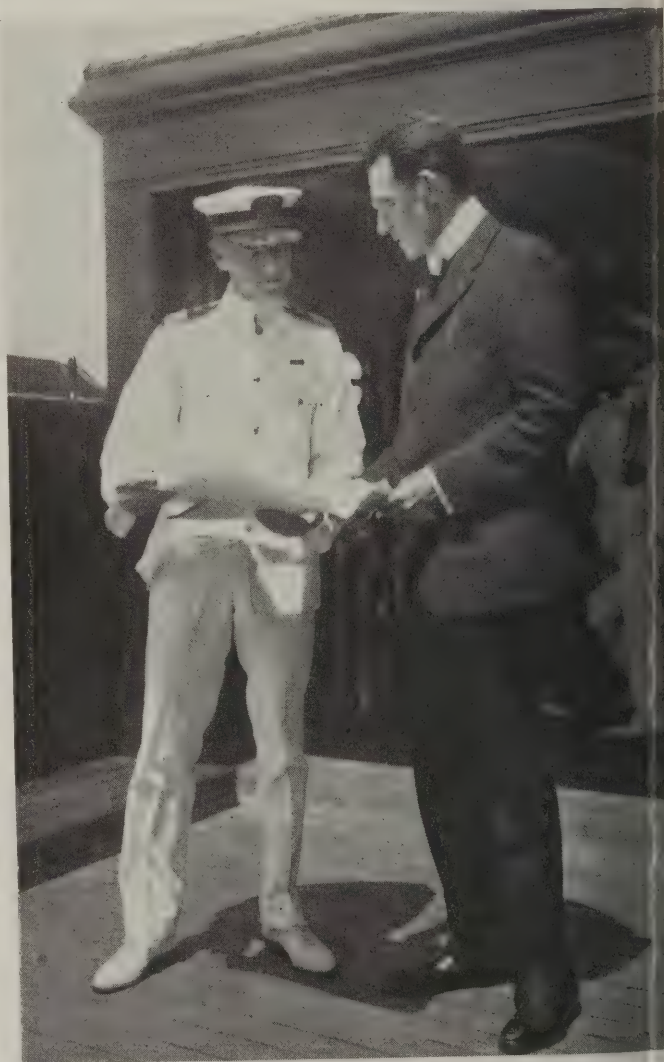
Jupiter Light House abeam 7.17 A. M., June 22d. Then followed the regular north-bound steamship track to Diamond Shoal Light vessel, arriving there 3.39 A. M., June 23d. Distance, 570 miles. Ship making an average speed of 27.99 knots.

From Jupiter Light House to lat. 36.52 N., long. 74.21 W., a distance of 687 miles, was made in 25 hours, making an average speed of 27.48 knots.

During the first hour of the trial run from Jupiter Light, the average speed of the vessel was 28.04 knots, and for a six hour period the average speed of the vessel was 28 knots.

the day and night and until late in the afternoon of Sunday, June 25, making it necessary to anchor off Ambrose light until nearly 5:00 P. M. The dock was reached about 8:15 after the ship had been accorded a noisy welcome by the whistles of every craft in the harbor.

On the original German trial trips the *Vaterland*, as the



Captain Herbert Hartley and W. F. Gibbs, President, Gibbs Brothers, Inc., Who Had Charge of Reconditioning the Leviathan



The Trial Board on the Leviathan's Record Run

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Left to right (seated): H. Brown, Captain C. A. McAllister, Captain R. D. Gatewood (chairman), Captain W. E. Griffith, A. S. Hebble. (Standing): J. F. Metten, Captain J. E. Bailey, C. A. Greaser (secretary).

ship was then called, had made a maximum speed of 25.84 knots burning coal.

The trial trip was made with a crew of 1,135 and with 456 passengers, including Mr. Lasker and Commissioners Thompson, Plummer and O'Connor of the Shipping Board. President J. B. Smull and Vice-presidents W. J. Love and J. F. Sheedy of the Emergency Fleet Corporation, President Homer Ferguson and officials and experts of the Newport News Shipbuilding & Drydock Company, and the other invited guests. The guests included a number of members of Congress, prominent shipping and railroad and business men and newspaper men.

TEST MADE UNDER ARDUOUS CONDITIONS

While the speed record was assisted to some extent by the Gulf Stream and a calm sea as the English record was by the still stronger current of the tides in the English channel, the test was made under most severe conditions in many respects, according to Mr. Gibbs, because of the effect of the high temperature of the semi-tropical seawater on the condensing apparatus. It is important to have as cold circulating water as possible. The circulating water at the time of the high speed run was at a temperature of about 84 degrees Fahrenheit as against about 60 degrees normally found in more northern waters where trials are usually run. As the higher temperature operates against obtaining the highest vacuum in the condensers, the performance under these conditions was considered remarkable. During the time the ship was in colder waters fog conditions prevailed for much of the time. When the ship was built the Germans took it to the North Sea for a test and our Navy trials are usually conducted off Rockland, Me. The warm latitude also afforded an excellent test of the ventilating apparatus.

W. F. Gibbs, who has devoted practically the past four

years to planning and carrying out the work of reconditioning the *Leviathan*, as well as the other technical men aboard who had participated in the redesigning, and members of the Shipping Board, were highly elated with the performance of the fuel oil plant and other new equipment, which in many respects exceeded their expectations. It was stated that no new ship of the largest type had ever been subjected to as severe conditions on a trial trip and yet the fuel consumption was less and the power generated, the revolutions per minute and the vacuum attained were greater than had been expected. While official figures as to the engine performance were not given out it was unofficially reported that the horsepower generated was approximately 84,000 and the revolutions per minute 184.

The ship is expected in service to make an average of about 23½ knots, leaving New York on Saturday at noon and arriving at Cherbourg Friday morning and Southampton Friday afternoon, but it was demonstrated that a more than ample reserve margin of power and speed is available for making better time if necessary. Not a pipe leak was found in the entire trip which would require the services of a pipe fitter and it was stated that no more work would be required after the arrival in New York than after an ordinary return trip. The power generated was greater than that for which the ship was originally designed and 25 percent greater than it had ever developed before, without strain. Also the guests were highly pleased with the service and appointments of the vessel.

PERFORMANCE HIGHLY SATISFACTORY TO OFFICIALS

The performance of the ship and the records made were the occasion of many felicitations among the officials and in the evening of June 22 a meeting was held in the first class social room at which moving pictures of the *Leviathan*

(Continued on page 412)



The Leviathan Receiving Her Finishing Touches in Commonwealth Dry Dock, South Boston, Mass., Prior to Her Trial Trip

S.S. "LEVIATHAN"

RECONDITIONED 1923

BY THE NEWPORT NEWS SHIPBUILDING AND DRYDOCK COMPANY

NEWPORT NEWS, VIRGINIA.

HULL No 264

PLANS PREPARED AND WORK SUPERVISED FOR
THE UNITED STATES SHIPPING BOARD
BY GIBBS BROTHERS, INCORPORATED
NEW YORK.

"OUT there," in the Golden West, they have the habit of speaking in superlatives, when describing the natural advantages of the country, as the highest mountains, the finest climate and the grandest scenery. While we in the East are perhaps not so favored by the magnificent works of God nevertheless we can point with pride to many of the greatest achievements of man, namely, the tallest buildings, the longest bridges, and now, thanks to the Newport News Shipbuilding and Dry Dock Company, the largest, the safest and perhaps the fastest ocean liner in the world.

It is true that this great ship was originally built in Hamburg, Germany, but she has, with the exception of the outside shell, been practically reconstructed in this country. Extensive structural changes have been made in the hull for the purpose of increasing her strength and safety. It may now be stated that she will still stay afloat even if any three adjacent hold compartments are flooded. She has been converted from a coal to an oil burner. The machinery has been overhauled and repaired. All quarters below the D weather deck are new construction. All passenger accommodations and crew's quarters have been reconditioned, decorated and furnished. Complete new galley and pantry equipment has been provided. An improved electric wiring system, new steam heating, plumbing, ventilation and drainage systems have been installed. Access holes have been constructed in the shell in the way of the fuel oil tanks so that oil sludge and residue may be easily removed when the vessel is in dry dock, new bilge keels have been fitted and, in fact, all the latest and improved fittings and equipment of American manufacture that will add to the safety and comfort of the passengers and vessel have been furnished by hundreds of sub-contractors.

PRINCIPAL CHARACTERISTICS

Length, overall	950 feet 7 inches
Length, between perpendiculars	928 feet 5 inches
Breadth, molded	100 feet 0 inches
Depth, molded to D deck	70 feet 4 1/4 inches
Block coefficient	0.625
Class, American Bureau of Shipping.	
Displacement	66,800 tons

Gross tonnage	59,957 tons
Net tonnage, about	28,000 tons
Boilers, modified Yarrow watertube	46
Engines, Parsons direct connected reaction turbines.	
Propellers	4
Officers and crew	1,115
First class passengers	976
Second class passengers	542
Third class passengers	944
Fourth class passengers	936
Decks, steel, extending full length	5
Decks, on superstructure	4

PLANS AND SPECIFICATIONS

Before work could be started on the *Leviathan* it was necessary to draw up a complete set of plans and specifications. Her original plans were not available and practically all of her interior had been removed to provide sufficient berthing space for from 11,000 to 12,000 troops. This work and the subsequent supervision of her reconditioning was performed by Gibbs Brothers, Inc., New York. As an indication of the thoroughness of their work it may be stated that the plans published in our issue of last November are accurate today.

BRIDGE DECK

The navigating bridge, located on the forward end of the bridge deck, is shown in one of the accompanying illustrations. It will be noted that it is protected from the weather on the forward side by a bulkhead extending the full width of the deck house and amply supplied with port holes. The sides of the protected area may also be closed by a removable partition. The bridge wings which extend slightly beyond the sides of the vessel are open. A pelorus actuated by the master gyro compass is located on each wing from which azimuths and bearings may be taken. The control for a 36-inch Sperry searchlight is located on the starboard wing.

Inside the protected area are installed the usual magnetic compass and steering wheel, a repeating Sperry gyro compass, engine room telegraphs, telegraphs for conveying instructions for handling the anchors and spring lines, rudder position indicators, pneumatic gages for indicating the for-

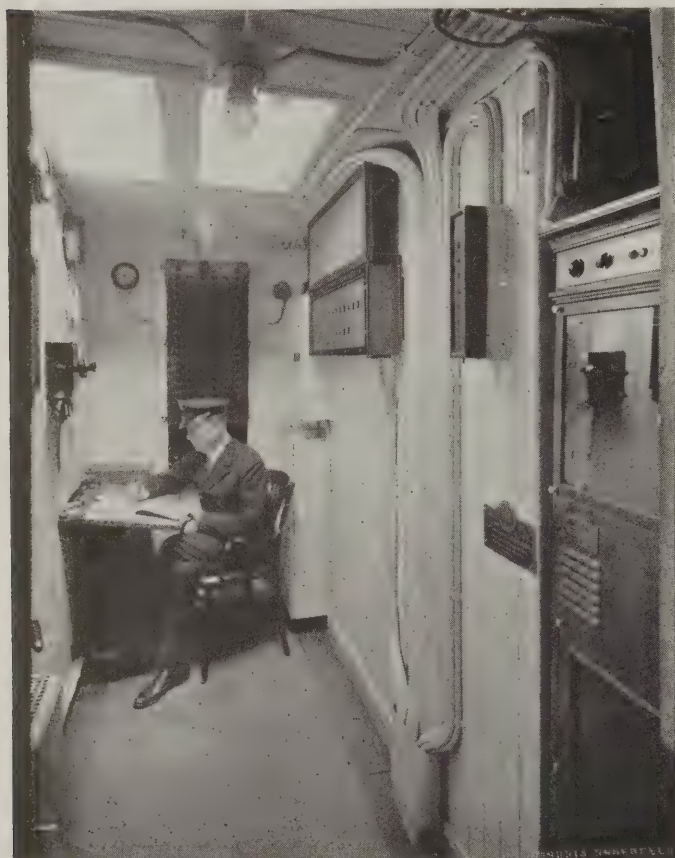
ward, mean and aft drafts and positive and automatic controls for the whistles and fog sirens. On the port side in an inclosed space is the receiving apparatus for the submarine signal system.

WHEEL HOUSE

In the wheel house just aft of the navigating bridge are many more instruments including a 30-day gyro course recorder, a Forbes log for determining both the speed and distance traveled, the watertight door diagram and hydraulic control and a magnetic and a gyro repeater compass. The vessel is provided with two master Sperry gyro compasses located in a special compartment below. They actuate five repeaters—three on the bridge, one in the wheel house and one in the captain's bedroom.

FIRE ALARM STATION

Aft of the wheel house in the officers' quarters is located one of the smallest but most important rooms on the ship,



Fire Alarm Station on the Bridge Deck

called the fire alarm station. In this room, which measures only 4 feet by 9 feet, are housed all the terminals of the different fire detecting and alarm devices. As shown in one of the accompanying illustrations, a man is always on duty here to assure immediate action in case of fire.

Just inside the door is a cabinet with a glass front in the upper portion, known as the "Rich System," for detecting and extinguishing fires. Inside the glass of this cabinet are the terminals of some twenty-two tubes. These tubes lead down to the compartments in the lower part of the ship or hold of the vessel, such as store rooms, baggage rooms, cargo spaces, oil room, lamp room, paint room, refrigerators, etc., which are not frequented by members of the crew. Directly above the cabinet is a suction fan which is constantly in motion, sucking up air from the different compartments. If at any time the slightest bit of smoke occurs in any one of these compartments, it will in the course

of only a few seconds find its way to the tube, come up to the station and show in the cabinet.

There are also, in connection with this system, two other cabinets situated on one of the lower decks, where, in case a fire is discovered in any compartment, by lifting a lever the upper part of the tube may be closed and the smoke shut off. Then by opening a valve, steam at a pressure of 240 pounds per square inch is sent down into the compartment filling it with steam and smothering the fire without anyone going near it. However, before turning on the steam it would be advisable to ascertain whether any one happened to be in the compartment, as a puff of smoke from a cigarette will show in the cabinet.

AUTOMATIC ALARM SYSTEM IN LIVING SPACES

Another device for detecting and locating a fire is known as the "Aero Automatic Fire Alarm." In each of the guest rooms, crew quarters, offices, galleys, pantries, etc., there is a rosette located on the ceiling which appears to be of wire but which in reality is a fine hollow tube made of copper. A sudden rise of temperature from any cause in any of these rooms for a duration of 30 seconds will cause the air in the tube to expand and press against a delicate sensitive diaphragm, which, in turn, will make an electric contact that will register the location on the annunciator in the fire alarm station. If, at any time, through accident or other cause, the electric current should be cut off from the system, the attention of the attendant is immediately attracted by a buzzer operated automatically when the current ceases. He will then notify the electrician by 'phone who will locate the trouble.

MANUAL ALARM SYSTEM

Scattered throughout the ship are a number of small fire alarm boxes with a glass front having a red light burning on top. These are known as and are in connection with the "Manual Fire Alarm System." There are forty-five of these boxes, each one numbered, and the members of the crew are required to know the location of these boxes according to their respective numbers. This system is practically the same as that used by the city fire departments, it being only necessary to break the glass to send in an alarm. The breaking of the glass relieves a plunger which forms an electrical contact and registers on the Cory annunciator located in the fire alarm station. It also rings a bell in the station and shows, by a red light, the number of the box in which the glass has been broken. Should one of the red lights on top of a fire box burn out or become loose in the socket; or should a wire become disconnected or broken, or, in fact, if anything should happen to break the current on any of these manual alarm circuits, a green light on the annunciator board will indicate the number of the circuit which is broken and a buzzer will attract the attention of the attendant. The electrician will then be notified of the trouble which must be immediately rectified.

As soon as an alarm comes into the station from any of these systems the attendant steps into the wheel house, which is only a few feet away, notifies the officer on watch and sounds the alarm on the bells which are located throughout the crew's quarters and in the engine room. By sounding the number of the alarm box nearest the fire, the crew are immediately apprised of the proper place to assemble. All of this is done so quickly that it would be impossible for a fire to make any headway. As soon as an alarm is sounded, the engineers on duty stand by the pumps which supply the pressure to the fire main and increase this pressure as needed.

A pressure is maintained at all times on the fire main and a pressure gage indicating it is located in the fire alarm station. If the pressure goes down, the engine room is notified and they immediately attend to it. So, there is never a time that water will not flow from every hydrant.



S. S. Leviathan: (1) Second Class Gymnasium, (2) Navigating Bridge, (3) Looking Aft from Bridge, (4) Motor Lifeboat, (5) Looking Forward on Boat Deck, (6) Second Class Social Hall, (7) Second Class Foyer



S. S. Leviathan, Flagship of the American Merchant Marine, Ready for Service

FIRE PROTECTION IN THE BOILER ROOMS

With the conversion of the vessel from coal to oil burning it became necessary to provide the utmost protection against the fire hazard involved in the handling, storage and burning of fuel oil. For this purpose a very complete Fire-foam fire extinguishing system was installed by Charles Cory and Son, Inc., New York, designers and installation engineers of the system.

A DECK

The first class smoking room is located at the forward end of the *A* deck directly under the officers' quarters. It is one of the pleasantest rooms on the ship as the forward end of the room is practically all windows that give an unobstructed view ahead. It is paneled in light fumed oak and furnished with leather and tapestry upholstered furniture. With its spacious alcoves and artificial fireplace it should be a comfortable place to while away the time.

The most of the space on this deck is devoted to the upper portion of the public rooms but amidships there is located the first class gymnasium equipped with various devices for keeping oneself fit on the voyage. At the extreme left end of the deck house is the galley of the Ritz-Carlton café, an illustration of which accompanies this article. The galley is equipped with electric ranges, electric bake oven, electric broiler, steam soup kettles, electric meat chopper and grinder, etc., and alongside of it is a room containing an electric ice-cream freezer and an electric griddle.

On the port side forward of the galley is a print shop fitted with three presses, a linotype machine, etc. There is a flower

store on the starboard after end of this deck and a dog kennel on the port side.

A deck may also be called the boat deck although a number of boats are located on *C* deck. There are seventy lifeboats, two of which are motorboats. There are also two work boats. The motorboats are specially designed by the Gibbs Brothers and are capable of towing all the lifeboats at once. They are equipped with an oil engine and a radio.

The lifeboats are nested in groups of three and are served by Welin quadrant davits. These davits can be worked in three ways, namely: By a crank attached to the davits, by levers attached to winches through wire rope leads or by electric motors through the winches and rope leads. A Jacobs ladder is stowed between each nest of boats. Lifeboats Nos. 1 to 12 are stowed on the forward island, 13 to 48 on this deck and 49 to 70 on *C* deck, even numbers being on the port side and odd numbers on the starboard.

B DECK

B deck is given up almost entirely to public rooms which are practically en suite. Many of them extend two deck heights and are so large that they give the appearance of being in a large hotel rather than in a steamship.

Forward on this deck is the first class library, the walls of which are finished in Nile green, which are lightened by a white ceiling. Along the forward side of the room are well stocked bookshelves and on the after side is a portrait of President Harding by Howard Chandler Christy. Easy chairs, writing desks and a carpeted floor provide a comfortable and quiet place for either reading or study.



Quarter Stern View of the Leviathan

Aft of the library comes the first class social hall, which may also be used for a ballroom or theater. It is finished in oak and contains several very large oil paintings. Over the center of the room is a large glass dome which is shown in one of the illustrations. At night the dome is electrically lighted and this is supplemented by reflected lights on top of the oak cornice as well as by numerous lights in brackets along the sides of the walls. The stage at the forward end of the hall is finished in oak and has on it a beautiful oak piano. The illustrations probably give a better idea of this room than can be given by a description.

Aft of the social hall is the grand foyer. It will be noted in one of the illustrations that was taken in this foyer looking forward into the social hall. Passing aft from the foyer one enters what is really two large rooms in one, namely: the palm court or winter garden, with its palm trees and fountains, and the Ritz-Carlton café, where meals are served à la carte. The walls of the palm court are finished in green lattice work with the chairs and tables painted to match. Great tall columns and the rich mahogany finish of the Ritz-Carlton restaurant aft of it are features of exceptional decorative interest.

Still farther aft on *B* deck in a space formerly used as a washroom is a charming tea room finished in Queen Anne style, in oak with color prints on the walls.

THE PROMENADE

Around the entire deck is a very spacious promenade, the use of which is shown in one of the illustrations. The forward part is inclosed with balanced glass windows, which may be opened or closed according to the weather. There

are three expansion joints in this promenade, which of course, extend from one side of the superstructure to the other.

C DECK

On *C* deck the space outside of the promenade is taken up by staterooms, some of which are in suites and others single rooms, both with and without baths. There are two premier suites, one starboard and the other port, which command \$5,000 a passage. These suites contain two bedrooms, a breakfast room, a sun parlor, a drawing room, which may be turned into a bedroom, a kitchenette and three bathrooms. The bedrooms are furnished with twin beds, reading lamps, dressing tables, washstand, davenport, special ventilation through a panel above the beds and many other features.

There are several more suites both on this deck and the deck below containing bedrooms, parlor, bath and trunk room, and, if desired, additional bedrooms may be connected. Typical single staterooms, as shown in one of the illustrations, are paneled in different kinds of wood and are furnished with twin beds, davenport, chairs, reading lamps, dressing tables, hot and cold running water, etc.

On the after end of *C* deck are some exceptionally fine second class staterooms and a veranda.

D DECK

The midship and forward portions of *D* deck are devoted to first class accommodations and the after part to second class public rooms consisting of a smoking room, foyer and social hall, all of which are equivalent in style and comfort to the first class quarters on many ships. The second class smoking room is finished in mahogany with leather uphol-

stered chairs. The social hall is done in white and is fitted with piano, carpets, bookcase and varied colored upholstery.

E DECK

As on *D* deck, the midship and forward portions are devoted to first class accommodations. The engineers' quarters and second class accommodations follow aft and the third class dining room is located still further aft.

F DECK

Fourth class quarters are located on the forward end of this deck followed by first class accommodations and the main dining saloon. Then come the first and second class galleys, the second class dining saloon and third class quarters.

The main dining saloon, which reaches clear across the ship, extends two deck heights in the middle portion. It is

signers had placed aboard the vessel electric bake ovens sufficient for the capacity of the entire vessel, both bread and pastry, and there were a number of other devices such as toasters and broilers used in the a la carte service in the Ritz-Carlton dining and tea room.

Under these conditions and with the elimination of a considerable amount of stateroom heating by electricity, it was found there would be available a fair excess of generator capacity which could be applied for the purpose of electric cooking.

The proposition was divided into three parts: First, all the bakery equipment, which was found to be rather inferior, was to be replaced with modern American design. This consisted of two 25-kilowatt, electric bread baking ovens for the first and second class bakery; one 25-kilowatt oven for the fourth class and crew, and two 9-kilowatt pastry



Main First Class Dining Room

surrounded by a gallery bordered by tall columns. The room is done in white and has a large painted dome which is surrounded by lights over the center. The illustration of this room shows the tables with their dark blue covers and individual lights.

THE SWIMMING POOL

The swimming pool on the deck below, as shown in one of the illustrations, is on the old Roman order. It is not only large in area but also extends two deck heights. A feature of the finish of this room is the stucco work on the walls, which was put on by the Marine Decking and Supply Company. Around the rooms are numerous dressing rooms, a rest room and a room for special baths of electric light and water.

ELECTRIC GALLEY EQUIPMENT

The officials who had charge of the reconditioning of the *Leviathan*, had, as a basis, the fact that the German de-

ovens, one for the first and second class and one in the Ritz-Carlton galley. Second, it was desired to use considerable electric heating for serving devices in pantries and dining room service. This service consists of a two-burner heating plate, and rectangular griddles for the preparation of hot cakes, toast, eggs, etc., without the expense of having this type of work done in the main kitchen. There are on board this vessel about five of these griddles and seven of the hot plates located in the various pantries and serving rooms, as mentioned.

Another important part of this service is in the main dining room where the serving tables, from which the food is distributed by the waiters, are equipped with electrically heated tops of the right temperature so that the food can be kept at the proper heat until it is served. In a large dining room where the distance from the serving pantries is very great, this type of device will be of great help. The amount of electric heat taken is very low, about 150 watts per table,



S. Leviathan: (1) Ritz-Carlton Restaurant, (2) Palm Court, (3) Alcove in First Class Smoking Room, (4) Entrance to Social Hall in Grand Foyer, (5) Corner of Social Hall, (6) Tea Room, (7) Swimming Pool



Library



First Class Smoking Room, Looking Forward, Showing Windows Overlooking Forward Deck of Vessel



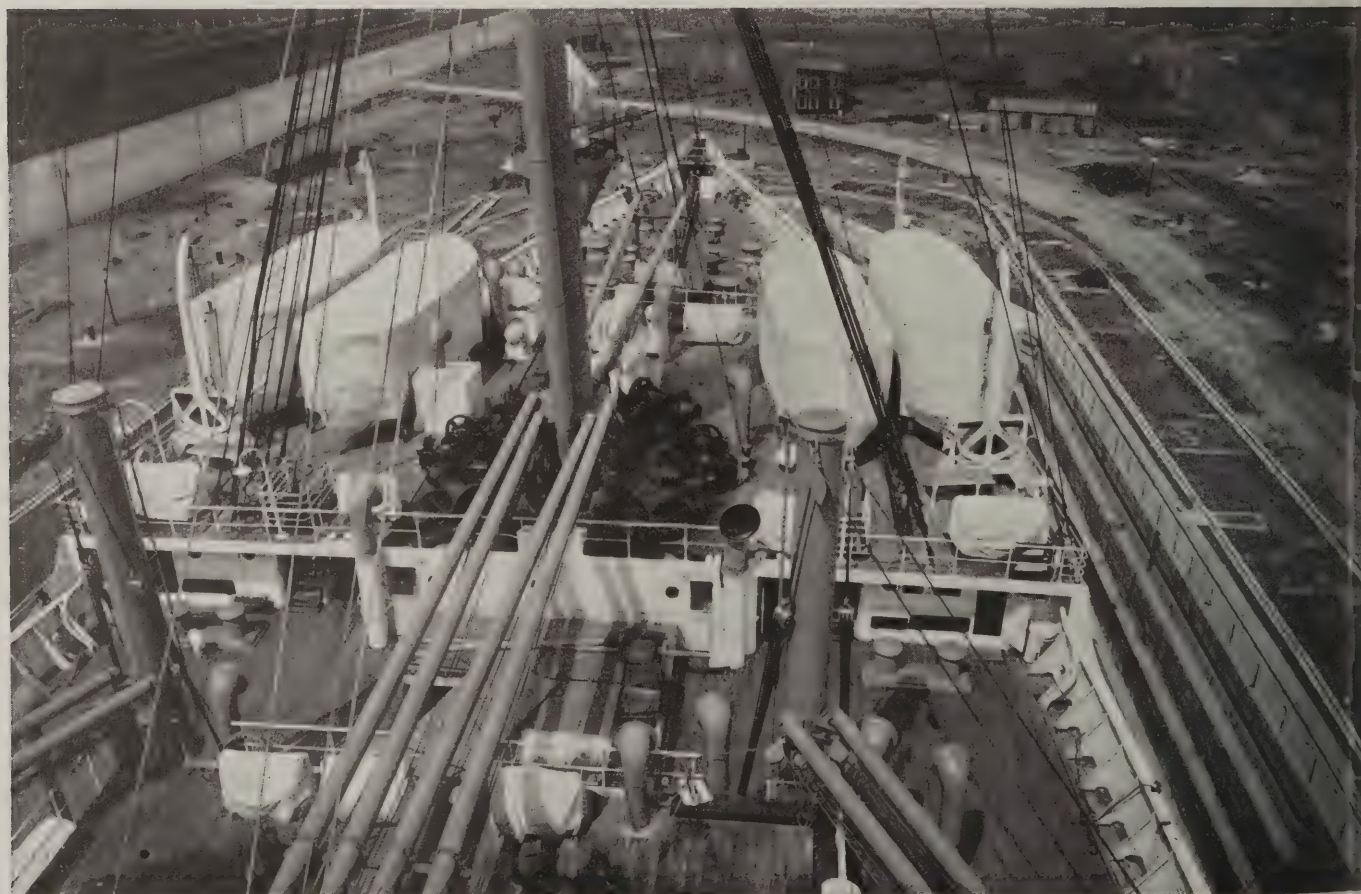
Main Social Hall, Looking Aft



Forward End of Social Hall, Showing Stage



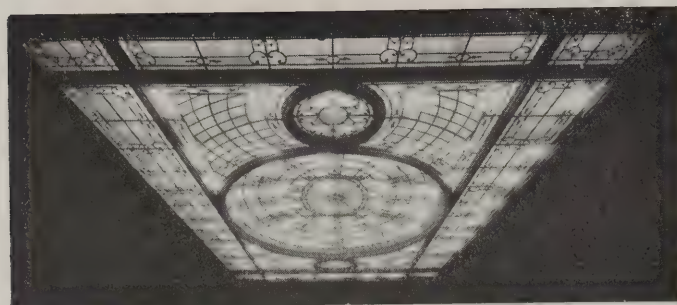
Promenade Deck



Looking Forward from the First Class Smoking Room



S. S. Leviathan: (1) Bed Room and Bath, de Luxe Suite; (2) Drawing Room, Premier Suite; (3) Bed Room, de Luxe Suite, Looking Outboard; (4) Typical First Class Stateroom, Looking Outboard; (5) First Class Stateroom, Showing Bath; (6) Bed Room, Premier Suite; (7) Breakfast Room, Premier Suite; (8) Sun Parlor, Premier Suite.



Glass Dome Over First Class Social Hall

and it is only necessary to provide outlet receptacles on the floors or pantries so that these tables may be plugged in like an ordinary portable lamp. In all there are forty of these tables.

The third part of the electrification was to install as many electric galley ranges in place of the original coal burning equipment as the capacity of the electrical generators would permit. The most difficult place to handle coal and ashes is in the Ritz-Carlton galley on *B* deck, and the electrical capacity was available to completely equip this galley with six 4-foot electrical hotel type sections, together with two broilers and the small bake oven, previously mentioned.

The rest of the galleys are coal burning with the exception of one oil-burning range in the crew's galley.

BAKE OVENS

The electric bake oven was among the first electric cooking appliances to be installed on shipboard. Space limitations, developments and the desire for a bakery location that would exclude the use of fuel ovens has promoted the use of electrical equipment. These ovens are of the so-called deck type, having three horizontal tile backs placed one above the other which are heated by independently controlled heating units placed above and below the decks so that uniform heating of the deck is assured and a convenient variation of the temperature of the decks is permitted.

The oven body is of steel, heavily insulated with heat resisting material so that the outside wall temperature rises but little. The switchboard is placed on one side of the oven and has large indicating switches fully protected against dirt and damage. Separate electrical fuses are provided for each heating circuit. Electric lights are provided for the inspection of the bread. It is also furnished with a steam coil attachment for crust baking. This oven is the Edison No. 300; it has a capacity of 25 kilowatts and will hold approximately 200 pounds of bread at a time.



Second Class Stateroom

ELECTRIC GALLEY RANGES

The electric ranges in the Ritz-Carlton galley are in sections 4 feet long and each section has a top cooking surface composed of four 9 by 24-inch cast plates into which has been cast a steel encased "nichrome" heating element, so that the plate and heating unit are inseparable and practically indestructible. Each plate has an input of 4,000 watts and is controlled by a separate switch. These top plates will come rapidly to cooking temperature and can be maintained at a bright red heat. They will not warp or distort and have the decided advantage of a uniformly heated, solid top. Each section has an oven below the cooking top 18 inches high by 21½ inches wide by 28½ inches deep. This oven is well insulated to hold the heat and has two heating elements, one at the top and one at the bottom, so that the operator has complete control of the amount and direction of the heat. These ovens will easily hold 100 pounds of beef in one cut and are very well known for their excellent results in baking and roasting due to the uniformity of the heat and its control. There are six of these sections placed in two rows of three each, back to back.

ELECTRIC BROILERS

The work of broiling is provided for in a separate room where charcoal broilers are installed. As an adjunct to this service, there are two electrical broilers installed. These are of the horizontal type, having a heating area 16 inches wide by 26 inches deep, adjustable griddle and snaps to control the heating element.

MISCELLANEOUS DEVICES

There are many other smaller electrical devices installed in the serving pantries and dining room, giving the steward the equivalent advantage of what might be called "gas service" in land installations. It is impossible to get this type of service on shipboard without the use of electricity as these small devices would not be practical with coal fuel. These give the stewards ready and convenient sources of heat for heating operations between meal times and as an adjunct to the service from the galley.

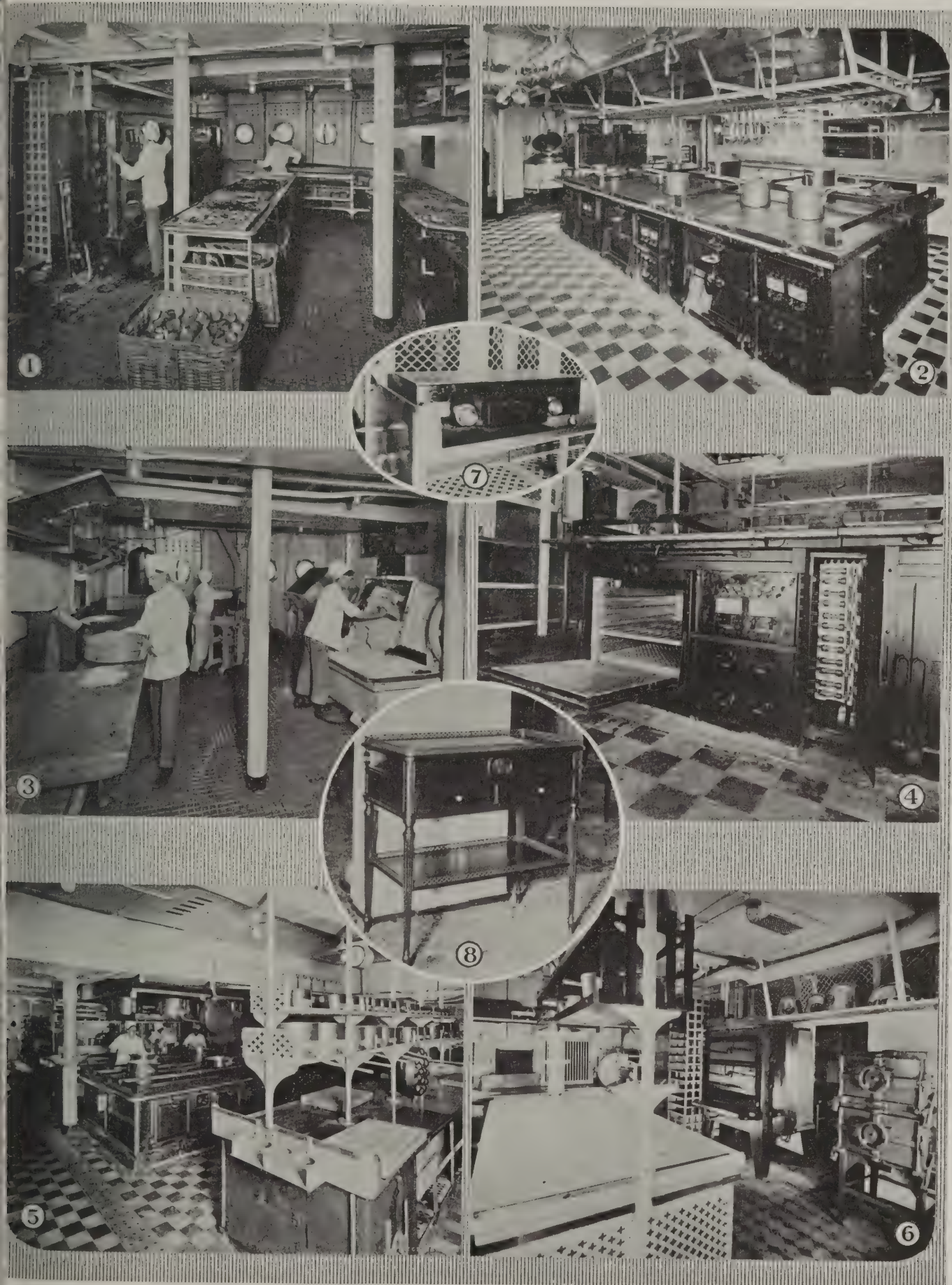
Another important function is the plate warmer in the dining saloon, previously mentioned. These consist of a nicely finished serving table to conform with the dining room architecture and furnishings, having recesses in their top into which is placed a rectangular steel plate having an electrical heating element on its lower side.

OIL BURNING EQUIPMENT

The contract for the oil burning equipment for the *Leviathan* was awarded to the Peabody Engineering Corporation of New York. While not representing so large a proportion of actual material required, the vital importance of the oil burners to the success of the vessel will be recognized by all. In fact, it represents the most important single item in the entire reconditioning of the vessel.

The selection of this equipment involved the matter of ability of the burners to meet the specified requirements of the Shipping Board as to capacity and efficiency in the use of the fuel, which provided that one ton of the most viscous oil obtainable must be economically burned per hour under each boiler. Also it was necessary to consider the adaptability of the burners to the special furnaces of the German built boilers, particularly as applied to the distribution of the gases of combustion to insure economy, and to prevent local overheating and impingement of the flame on the boiler tubes and brick work.

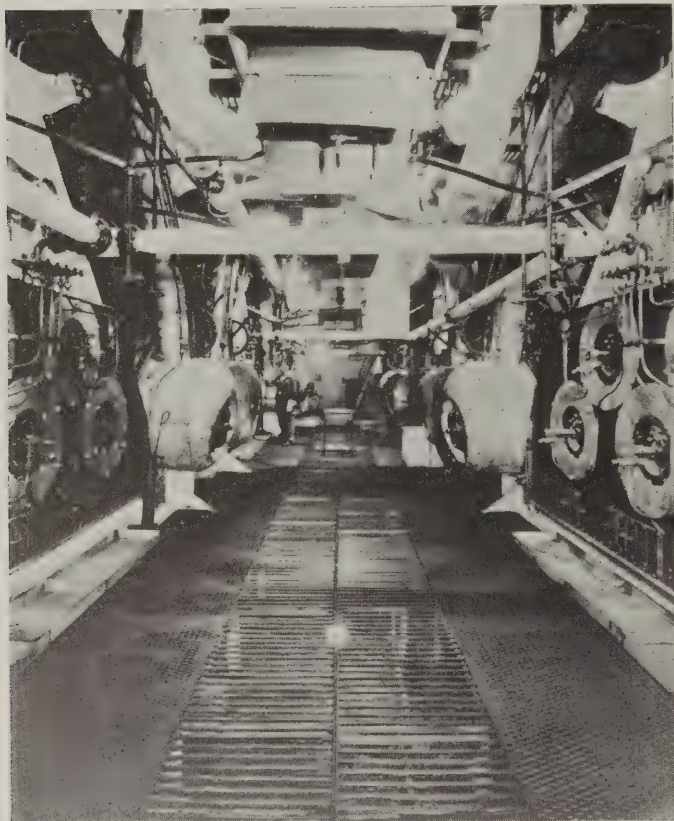
Mr. Ernest H. Peabody, the inventor of the burner, has not only had a wide experience in burning oil fuel under many types of boilers, and under a very great variety of conditions, but is a recognized authority on marine boilers, particularly those of the watertube construction, and furthermore, he had had some special experience with a type of



S. Leviathan: (1) Bakery, (2) Ritz-Carlton Galley, Showing Electric Ranges, (3) Dough Mixing Room, (4) Detail of Electric Range, (5) First Class Galley, (6) Pastry Bakery, (7) Electric Griddle, (8) Electric Heated Serving Table.

boiler very similar to that installed on the *Leviathan*. It is interesting to note, therefore, in connection with the *Leviathan* contract, that Mr. Peabody was personally consulted in the matter of the details of installation of the furnace walls, selection of the proper refractory materials and general design of the furnaces.

The equipment consists of 230 Peabody mechanical atomizing burners and air registers, five units being installed on each of the 46 boilers. The air for combustion is delivered to the fire room by means of blowers operating under very slight pressure head. The air then passes through specially constructed air heaters arranged in the uptakes of the boilers, thus utilizing a portion of the waste heat from the gases in heating the air for combustion on its passage to the burner.



General View of One of the Boiler Rooms

After leaving the heaters the air flows through a double casing to the front and rear of the boilers, that portion which passes to the front flowing directly to the air registers, and that passing to the rear being conducted under the furnace floors through ducts, which communicate with the air box or double front on the boilers in which are located the air registers which control and deliver the air to the burners.

It will be evident, therefore, that not only is waste heat recovered from the escaping gases for combustion, but the boiler casing, including that beneath the furnace floor, is cooled by the passage of the air, and the radiation of heat into the boiler room is greatly reduced. The trials of the vessel have, in fact, demonstrated that the fire rooms of this vessel are very comfortable even under the semi-tropical weather conditions prevailing during the trial trip.

It will be noted in this connection, that this method of utilizing draft is much cooler than would be the case if the air were delivered through ducts directly to the air heaters, for the reason that all the air for combustion goes through the fire rooms and acts as a ventilating medium for the fire rooms.

Under ordinary steaming conditions the fire rooms of the

vessel will not be closed and the air pressure will be practically equivalent to that of the atmosphere. The work of drawing the air through the heaters and casings and delivering same to the air registers and thence to the burners, and also of drawing the escaping gases through the boilers into the uptakes, is therefore accomplished by the natural draft suction of the vessel's funnels, which are about 170 feet in height above the burners. Under forced conditions, the fire rooms may be closed and the air pressure raised to about one-half inch water pressure, or just about sufficient to overcome the resistance offered by the air heaters and double casings of the boiler.

The Peabody air register is well known for its simple construction, ease of regulating and controlling the air for

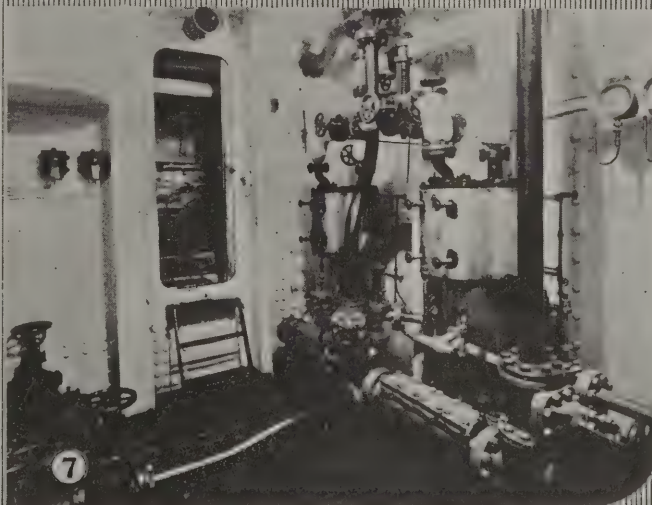
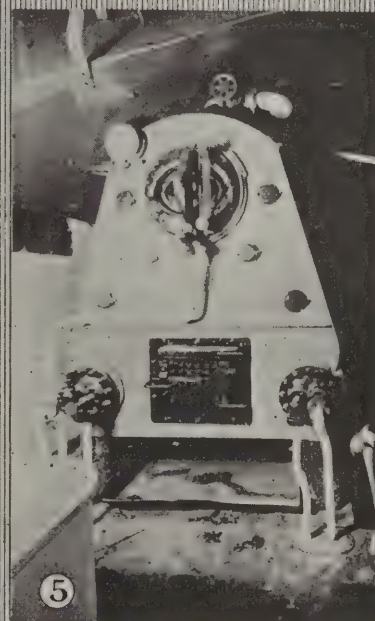
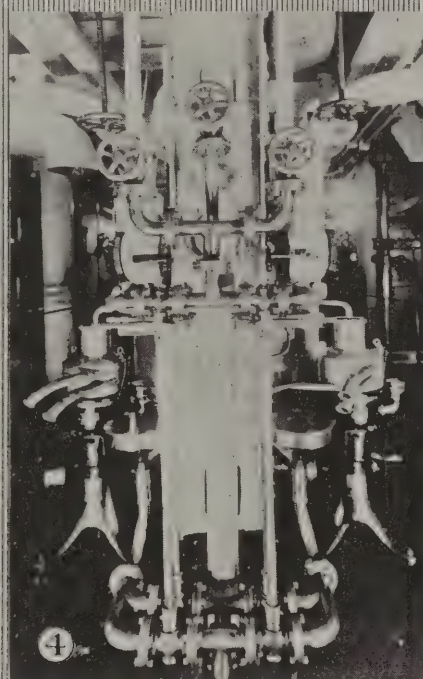
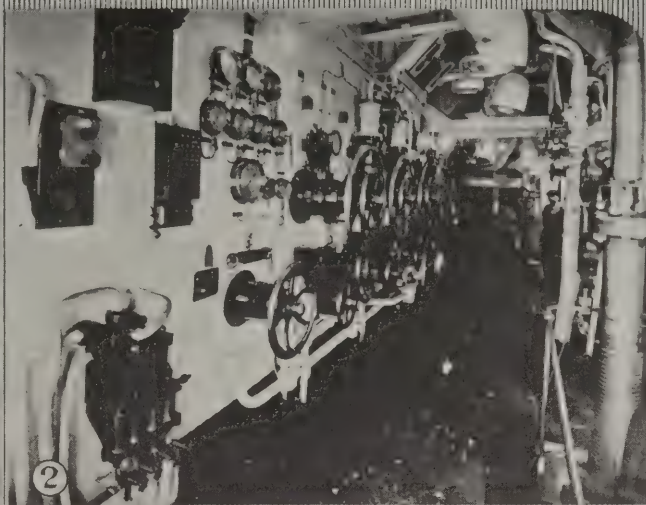
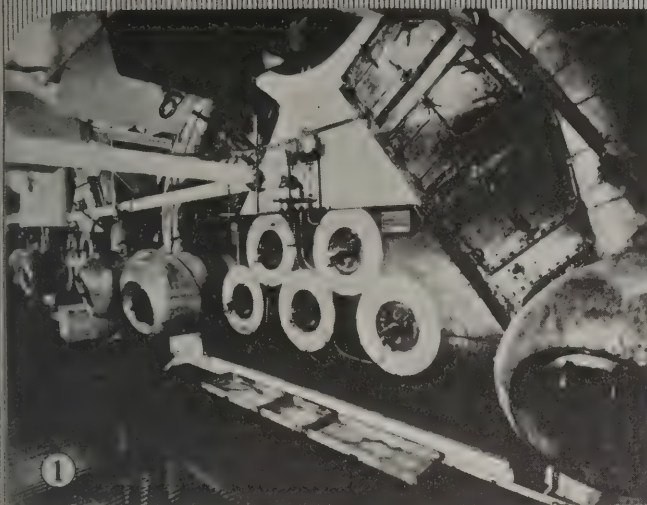


General View of the Engine Room

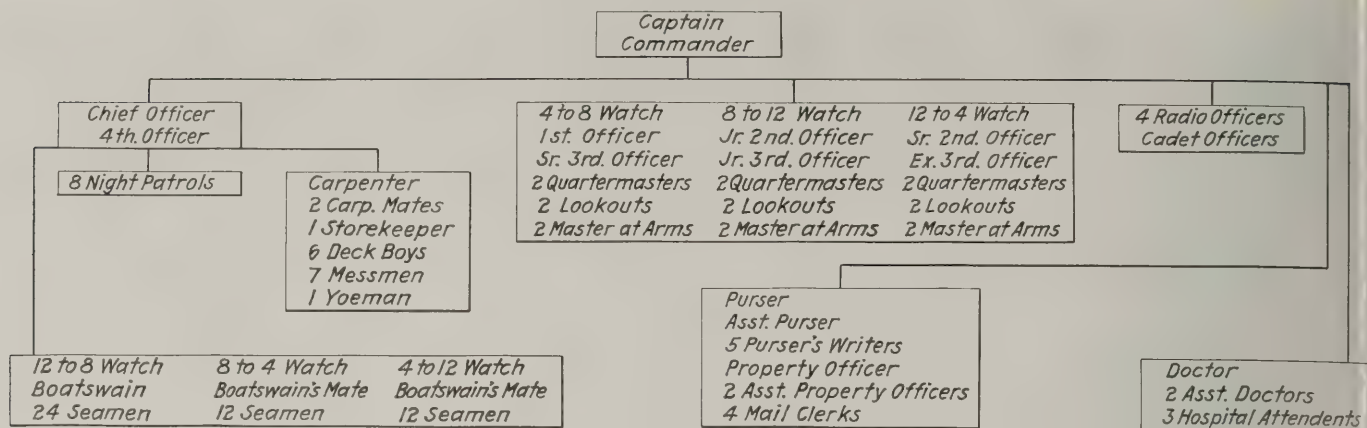
combustion and low resistance to the flow of air through same. The air control doors are arranged to form the surface of the frustum of a cone when in the closed position, and, when opened, will give the air a rotary motion as it passes to the burners. Owing to the fact that the air doors are adjacent to each other without the use of intermediate members or "door jambs," the entire surface of the cone is available for the entrance of the air, barring the very small resistance offered by the hinge bolts.

The operating gear consists of a hand wheel and lock nut communicating with a rack and pinion on the inside of the front plate of the register, which operates all doors simultaneously and holds them in a fixed position. A suitable inspection and lighting hole is provided directly above the burners, together with two additional openings which can be used for giving access for cleaning.

The burner is supported on a bracket in the center of the front plate of the register which carries a tube through which the burner is inserted when in operating condition. Quick, detachable yoke couplings serve to connect the burners to the oil delivery lines, and the yoke is so arranged that when the burner is removed, the carefully machined surface



S. S. Leviathan: (1) One of the 46 Boilers, Showing Fuel Oil Burners; (2) Operating Platform; (3) Fuel Oil Heat-
ers; (4) Lubricating Oil Manifold and Separators; (5) New Donkey Boiler; (6) Looking Forward at Aft End of Port Low
Pressure Turbine; (7) Fuel Oil Service Pumps in No. 4 Fireroom, Showing Pump Governor, Quick Closing Throttle Valves
and Suction Strainers.



Leviathan Deck Department Organization Chart

of the coupling is protected from damage. These yoke couplings are all interchangeable so that any burner can be installed in any air register at a moment's notice.

Like all mechanical burners, the atomization is accomplished by centrifugal force induced by delivering the oil tangentially to a central chamber at the tip of the burner. In the Peabody design, the tangential passages and the outlet orifice, together with the central chamber, are contained in one very carefully machined member which is easily removed and replaced when it is desired to change the size of the burner, or when it is necessary to clean out any extraneous matter which may pass the strainers and reach the burner tips.

Readers of this article will perhaps be interested to know that the "wide range" feature which is usually furnished with the mechanical burners manufactured by the Peabody Company was not supplied with the burners installed on the *Leviathan*. Thus, in the selection of the burner, the added advantage of the wide range feature played no part, and the burner and air register were approved on their merits as a "straight" mechanical burner equipment. It is believed by the manufacturers of the burner that the wide range feature could be added with little additional cost, resulting in a considerable reduction in the fire room force and added efficiency in operation.



The Largest Anchor in the World

The largest anchor in the world was recently completed at the Thurlow Works of the American Steel Foundries at Chester, Pa., for the S. S. *Leviathan*, reconditioned at the Newport News Shipbuilding and Dry Dock Company, Newport News, Va. The anchor is of cast steel, of the Dunn stockless type and weighs 33,300 pounds.

The commanding officers of the *Leviathan* and the personnel of the engine room staff are as follows:

LIST OF DECK OFFICERS

Herbert Hartley, captain.
Hubbard C. Fish, staff commander.
Kenneth B. Lowry, chief officer.
Joseph P. Linden, first officer.
Ephraim W. Higgins, second officer.
Harry Manning, second officer.
Louis M. Sanders, third officer.
John S. Bowen, third officer.
Gordon F. Danforth, third officer.
Walter E. Burns, fourth officer.
Three cadet officers.

LIST OF LICENSED ENGINEERS

Chief: Robert L. Harrison.
Staff Chiefs: John J. Fagan, Robert Douglas, William Lundy.
First Assistants: Burton L. Cartmel, Charles W. Isgar, David H. Betts.
Second Assistants: E. L. Dawson, M. P. Iverson, Marshall Cowell.
Senior Thirds (18): E. J. Deeds, E. J. Landers, James Senlle, George L. Clow, G. H. Begley, G. C. Merry, L. L. Sztakowski, A. R. Brebner, W. M. O'Connor, A. H. Claudius, M. T. Minnihan, W. J. Brookie, A. Schlexer, F. H. Kipper, Thomas Webster, A. M. Davis, H. J. Williamson, C. Hunt.
Junior Thirds (16): J. W. Thomas, W. R. Fernald, W. J. Smith, E. L. Powell, J. F. Halle, C. C. Clark, W. G. Hawkins, C. H. S. Hallett, F. B. Mulroy, J. T. Olson, J. A. Smith, W. B. Schaum, J. E. Bacorn, J. A. Hanna, F. J. Sholl, H. G. Thompson.
Hydraulic Engineers: W. E. Wallace, D. Coogan, T. H. Bowker.
Deck Engineers: J. L. Moore, E. L. Moritz, F. Lewis.
Fourth Assistant Engineers: E. F. Sawyer, E. J. Thawley, G. C. Tucker.
Refrigerating Engineers: G. W. Bailes, Thomas Egan, H. Franklin.
Electricians: R. J. Cross, J. R. Dale, A. F. Neely.
Assistant Electricians: E. H. Quos, T. E. Brown, A. J. Cann, W. F. James, J. C. Howard, T. Anderson, J. J. Elan, C. G. Snowden, H. R. Macy.
Sanitary Engineers: A. G. McCarthy, James Sheridan, A. W. Thomas, J. H. Garriss, J. E. Johnson, J. J. Maynard.
Boiler Makers: S. Crawford, J. Boyle.

MOTORSHIP LAUNCHED AT BRISTOL.—Messrs. Chas. Hill and Sons, Albion Dockyard, have just launched the third of the ocean-going motor vessels that have been built in Bristol. The other two were the British India Steam Navigation Company's passenger and cargo ships *Dumra* and *Dwarka*. The new vessel, the *Margretian*, is the largest of the three and is only 15 feet shorter than the largest vessel ever launched in Bristol. Her dimensions are: Length, 310 feet; breadth, 43 feet 6 inches; depth, 26 feet. She will be fitted with two internal combustion engines and twin screws. Her gross tonnage is about 2,800. The vessel has been built to the order of Messrs. Owen and Watkins Williams & Company, Cardiff, proprietors of the Golden Cross Line, having a regular service between Bristol and the Mediterranean in the general cargo and fruit trade.

Marine Standards Committee Ready for Action

Constitution and Rules of Organization Adopted—Method of Developing Standards Outlined — Members of Technical Committees Appointed

THE constitution and rules of organization and procedure under which simplification and standardization in the shipping industry will be carried out have been completed. At a recent meeting in New York of the executive board of the American Marine Standards Committee, every provision was made for carrying out in detail the important work in all branches of the field. Great credit is due Secretary Hoover, of the Department of Commerce, for starting and sponsoring this movement in every industry in his campaign on the "Avoidance of Waste." Many branches of the

has been developed as far as the tentative stage by a subject committee, it then goes to the technical committee under which it is working, and, if passed by that body, it will then be forwarded to the secretary. The secretary will then promptly submit an outline of the standard to all concerns interested and invite their comments. The proposed standards, together with such comments as come in in a reasonable time, will be submitted by the secretary to the executive board. The board may order future study and send it back to its technical committee with comments or it may do one of three things, namely:

1. The board may, by a favorable majority vote of all its members, approve it as *Suggested American Marine Practice*, or
2. It may, by a favorable two-thirds vote of all its members, approve it as a *Tentative American Marine Standard*, or
3. It may, by a favorable three-fourths vote of all its members approve it as an *American Marine Standard*.

The votes of the executive board upon any proposed standard will be obtained by ballot.

To the Shipbuilders, Manufacturers of Appliances and Supplies for Marine Use and the Ship Operators of the United States

June 13, 1923.

Gentlemen:

The American Marine Standards Committee, created by the shipbuilders and manufacturers of appliances and supplies for marine use for the purpose of erecting standards and securing simplifications in many elements of ship construction, etc., promises to be of very great importance to the industry.

The Department of Commerce has placed at the disposal of the Committee the services of its Division of Simplified Practice and the Departmental laboratories for the development of such standards and simplifications as the Committee may think wise to recommend to the industry.

The results obtained in other industries by movements of this character originating from the industries themselves have been of the most important character and all contribute to overcome the natural handicaps in which we are placed in international competition.

I am glad that the Department should be able to co-operate with the industry in this movement and I believe the support of the Committee by the industry itself will bring important results to the manufacturers and shipowners.

Yours faithfully,

(Signed) HERBERT HOOVER.

manufacturing industry have started this work and it is particularly gratifying that shipping, in which maximum efficiency is an absolute necessity, has succeeded, largely through the efforts of Colonel E. A. Simmons, president of the American Marine Association, in enlisting the services and cooperation of our most prominent naval architects, marine engineers and ship operators.

Without the cooperation of the best men in the field, the movement would have no chance of success. This was fully realized and great care was taken in preparing the constitution and rules to prevent the possibility of any standard being adopted that had not received the most careful and authoritative consideration.

HOW STANDARDS WILL BE DEVELOPED

In order to do this, the executive board has divided the work among five technical committees which in turn will appoint subject committees for specific items. When a standard

REQUIREMENTS FOR MEMBERSHIP

Having shown how standards will be developed, it is appropriate to explain how individuals, companies, societies, government departments, and all either directly or indirectly concerned, can secure membership and take part in the work of the organization. The mass membership is composed of individuals, partnerships, corporations, societies, Government departments, public bodies, etc.

It will be noted that the mass membership is divided into two divisions, those who contribute funds or direct service and those who only cooperate in technical work. From these two classes of member bodies there is drawn the representative membership from and by which the members of the executive board will be taken and elected.

THE EXECUTIVE BOARD

The present executive board, every member of which is widely known, is constituted as follows:

Colonel E. A. Simmons, president, American Marine Association, 30 Church Street, New York City, representing the American Marine Association, chairman; Captain R. D. Gatewood, U. S. N., manager, Department of Maintenance and Repair, United States Shipping Board Emergency Fleet Corporation, 45 Broadway, New York City, representing the U. S. Shipping Board, vice-chairman; Charles F. Bailey, engineering director, Newport News Shipbuilding & Dry Dock Company, Newport News, Va., representing shipbuilders for engineering details; Hugo P. Frear, naval architect, Bethlehem Shipbuilding Corporation, Limited, Bethlehem, Pa., representing shipbuilders for hulls and fittings, also the Atlantic Coast shipbuilders' Association; E. H. Rigg, naval architect, New York Shipbuilding Corporation, Camden, N. J., representing the Society of Naval Architects and Marine Engineers; William Francis Gibbs, president, Gibbs Brothers, Incorporated, 1 Broadway, New York City, representing the American Steamship Owners' Association; Captain C. A. McAllister, vice-president, American Bureau of Shipping, 50 Broad street, New York City, representing the American Bureau of Shipping; Captain John F. Milliken, secretary and treasurer, Neptune Association, 21 Pearl Street, New York City, representing masters, mates and labor organizations; Rear Admiral J. D. Beuret, U. S. N., chief of Bureau of Construction and Repair, Navy Department, Washington, D. C., representing the Bureau of Construction and Repair, Navy Department (alternate member, Rear Admiral Robert Stocker (C. C.), U. S. N., Bureau of Construction and Repair, Navy Department, Washington, D. C.); Admiral J. K. Robison, U. S. N., chief of the Bureau of Engineering, Navy Department, Washington, D. C., representing the Bureau of Engineering, Navy Department (alternate member, Captain J. T. Tompkins, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.); Brigadier General H. Taylor, U. S. A., Corps of Engineers, United States Army, War Department, Washington, D. C., repre-

sending the Corps of Engineers, U. S. A.; General George Uhler, supervising inspector general, United States Steamboat Inspection Service, United States Department of Commerce, Commerce Building, Washington, D. C., representing the U. S. Steamboat Inspection Service; John W. Gray, assistant to general manager, Newport News Shipbuilding & Dry Dock Company, Room 410, Harrison Building, Philadelphia, Pa., representing the American Society of Mechanical Engineers (alternate member, H. H. Brown, managing editor, MARINE ENGINEERING AND SHIPPING AGE, 30 Church street, New York City).

The Technical Committees that have been appointed to supervise simplification and standardization are as follows:

COMMITTEE ON HULL DETAILS

W. A. Dobson, naval architect, William Cramp & Sons' Ship and Engine Building Company, Philadelphia, Pa., chairman; E. L. Stewart, naval architect, Standard Oil Company of New Jersey, 26 Broadway, New York City; W. R. Bean, assistant naval architect, New York Shipbuilding Corporation, Camden, N. J.; A. B. Brown, naval architect, Sparrows Point Plant, Bethlehem Shipbuilding Corporation, Sparrows Point, Md.; J. W. Hudson, naval architect, Sun Shipbuilding Company, Chester, Pa.; H. F. Norton, naval architect, Newport News Shipbuilding & Dry Dock Company, Newport News, Va.; Axel Rossell, chief constructor, Gibbs Brothers, Incorporated, 1 Broadway, New York City; Commander H. S. Howard (C. C.), U. S. N., in charge of new design, Bureau of Construction and Repair, United States Navy Department, Washington, D. C.; Horace H. Thayer, consulting naval architect, 119 South 4th street, Philadelphia, Pa.; Hugo P. Frear, naval architect, Bethlehem Shipbuilding Corporation, Limited, Bethlehem, Pa.

COMMITTEE ON ENGINEERING DETAILS

A. A. Howitz, chief engineer, Sun Shipbuilding Company, Chester, Pa., chairman; Charles P. Wetherbee, vice-president, Bath Iron Works, Limited, Bath, Me.; M. L. Katzenstein, manager, Marine Department, Worthington Pump & Machinery Corporation, 115 Broadway, New York City; W. W. Smith, chief engineer, Federal Shipbuilding Company, Kearny, N. J.; J. B. Crew, chief engineer, New York Shipbuilding Corporation, Camden, N. J.; R. Warriner, chief engineer, Bethlehem Shipbuilding Corporation, Ltd., Quincy, Mass.; James S. Milne, chief engineer, Todd Shipyards Corporation, 25 Broadway, New York City; John F. Metten, chief engineer, William Cramp & Sons' Ship & Engine Building Company, Philadelphia, Pa.; Commander S. M. Robinson, U. S. N., head of design division, Bureau of Engineering, U. S. Navy Department, Washington, D. C.; Charles F. Bailey, engineering director, Newport News Shipbuilding & Dry Dock Company, Newport News, Va.; A. E. Ballin, president, McIntosh & Seymour Corporation, Auburn, N. Y.; A. B. Homer, marine engineer, Bethlehem Shipbuilding Corporation, Ltd., Bethlehem, Pa.

COMMITTEE FOR SHIP OPERATION, DETAILS AND SUPPLIES

A. S. Hebble, superintending engineer, Southern Pacific Lines, Pier 49, North River, New York City, chairman; R. F. Hand, assistant manager, marine department, Standard Oil Company of New Jersey, 26 Broadway, New York City; Walter L. Green, Jr., superintending engineer, Luckenbach Steamship Company, 44 Whitehall street, New York City; H. M. Wesson, superintending engineer, United American Lines, Inc., 39 Broadway, New York City; W. B. Ferguson, superintendent of construction, Newport News Shipbuilding & Dry Dock Company, Newport News, Va.; N. J. Pluymert, marine superintendent, Standard Transport Company, 26 Broadway, New York City; P. H. Harwood, marine manager, Pan American Petroleum & Transportation Company, 120 Broadway, New York City; George B. Drake, manager, marine department, Texas Company, 17 Battery Place, New York City; Captain Henry M. Seely, supervising inspector, second district, U. S. Steamboat Inspection Service, Custom House, New York City; John W. Gray, assistant to general manager, Newport News Shipbuilding & Dry Dock Company, Room 410, Harrison Building, Philadelphia, Pa.; H. C. Higgins, district agent, division of operations, U. S. Shipping Board Emergency Fleet Corporation, Philadelphia, Pa.; Captain H. L. Wyman, U. S. N., assistant to chief of Bureau of Engineering, Navy Department, Washington, D. C.; L. B. Shuman, principal assistant engineer, U. S. District Engineer's Office, Witherspoon Building, 1321 Walnut street, Philadelphia, Pa.

Two other committees are yet to be appointed; namely, the committee on port facilities and that on manufacture and construction.

The secretary of the organization is Mr. A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

A special committee was appointed at the recent meeting of the board with power to designate specific subjects to be taken up by the technical and their subject committees.

Leviathan on Trial Trip Breaks World Records

(Continued from page 393)

before, during and after the reconditioning were shown and addresses were made by Mr. Lasker, Mr. Gibbs, Mr. Ferguson and by Edward Price Bell on behalf of the newspaper correspondents. In these addresses it was shown that the work of reconditioning, including the trial trip, has been done within the appropriation of \$8,200,000 made on estimates of two years ago, that the contracts were performed without extras and that the trial trip, which had been criticised in some quarters, had been made within the estimated cost of \$120,000. Mr. Lasker stated that the Newport News Shipbuilding and Dry Dock Company had suffered a loss of \$1,200,000 in its part of the contract, which amounted to \$6,100,000, partly because while the bids were made during a time of unemployment, the work was completed in a time when there was a great demand for labor. He expressed great appreciation of the character of the work done and the degree of cooperation shown by the Newport News company and said that to reproduce the vessel in its present condition would cost \$25,000,000.

TRIAL TRIP NECESSARY

Mr. Ferguson also expressed appreciation of the attitude shown by Mr. Lasker and the Shipping Board in backing up the recommendations of the experts without the interference that sometimes characterizes Government work.

As demonstrating the necessity for a trial trip, which had been denied by some critics of the board on the ground that it was only a junket, it was shown that before all the detailed functions pertaining to the operation and service of the vessel could be expected to be performed with the smoothness desired of the greatest ship in the world time would be required to give the men an opportunity to work together and develop a thorough team work; also that the ship had not been run under full power before because its bottom had not been cleaned for 3½ years and that during the slow speed trip from Newport News to the drydock at Boston a cracked propeller hub had been discovered which would have resulted in excessive strain in the shafting and might have caused considerable damage if an attempt had then been made at high speed. There is also a large number of underwater valves which had to be overhauled in drydock. Mr. Ferguson said it was highly complimentary to his company to suggest that the ship did not need a trial but that for the Government to accept it without one would hardly have indicated prudence and that his company could not afford to conduct the trial itself because it was impossible to fully insure so large a ship.

Mr. Lasker said that although it had been almost kept a secret even from him, the attaining of the world speed record was one of the objects Mr. Gibbs had had before him all the time and Mr. Lasker and Mr. Ferguson both emphasized the need for an American merchant marine and the impetus that would be given toward it by the successful completion of the new *Leviathan*.

Mr. Lasker also said that while he did not believe in Government operation and while he had had "fifty years of hell in two winters" as a Government official, apparently the President and the Shipping Board now have no alternative to direct Government operation of the Shipping Board fleet and that if we cannot have a merchant marine in any other way he is willing to have it under conditions which he does not like.

Tests of the machinery and equipment were conducted by a trial board consisting of Captain R. D. Gatewood, chairman, Harry Brown, J. F. Metten, A. S. Hebble, J. E. Bailey, Captain W. E. Griffith, Captain C. A. McAllister and C. A. Greaser, secretary. All trial data in connection with the main machinery and engine room auxiliaries, including auxiliary lighting equipment, were obtained for the agent under the direction of Henry C. E. Meyer, chief engineer. All other trial data, including all hull engineering, passenger equipment, galley and pantries, etc., were obtained under the direction of Axel Rossell, chief constructor, and G. A. Anthony, assistant chief constructor.

TESTS

Among the tests made in addition to the obtaining of engine room trial data were:

500 kilowatt geared turbo generator was tested for one hour carrying full service load, exhausting against back pressure, exhaust being used in feed heaters or bled to main low pressure turbines as required in service. Other machines were operated in parallel electrically, exhausting to common auxiliary exhaust.

Lifeboat tests.

Test of hydraulically operated watertight doors controlled from bridge.

Test of Rich fire detecting and extinguishing system covering the cargo holds, fore and aft. Smoke was produced first in the forward hold, later in the after hold. The detection cabinet determined the location of the smoke and steam was turned on momentarily to see that it is in operating condition.

Test of new 2 kilowatt vacuum tube radio telephone.

Test of whistles, siren and engine order telegraphs.

Test of steering telegraph and anchor telegraph.

Test of deep sea sounding machine.

Test of new Sperry 450,000,000 beam candlepower searchlight.

Test of emergency lighting (storage batteries).

Test of the various ventilation systems, 257 in number, operated at full power.

Test of new 6 kilowatt vacuum tube radio telegraph.

Test of pneumatic draft gages.

Test of manually operated stand-by engine.

Hour test of electrically operated fog bell.

Test of Kent clear view screens.

Test of aero automatic fire alarm from different circuits throughout the vessel.

Test of manual fire alarm system from different boxes throughout the ship.

Test of salt and fresh water sanitary system.

Gyro compass test including change of master compasses and transfer of repeaters.

Test of annunciator system and loud speaking telephones.

Test of 2 kilowatt radio spark set.

Test and inspection of all culinary apparatus.

Test of submarine signal apparatus.

Test and inspection of elevators and dumbwaiters.

The congressional guests joined in the general enthusiasm over the success of the run and in the praise of the Shipping Board official that had brought it about. Among those who gave expressions of this character to the newspaper men for transmission to their papers by radio were Senator Fletcher of Florida, Senator-elect Edwards of New Jersey, Senator Oddie of Nevada, Representative Madden of Illinois, chairman of the House Appropriations Committee; Representatives Gallivan of Massachusetts, McFadden of Pennsylvania, Bloom of New York, Burton of Ohio and Britten of Illinois. Representative Madden also referred to the guests on the "junker" as "the best behaved and most circumspect crowd I have ever seen" and said he had been convinced of the necessity for a trial trip.

NEW RADIO RECORD

New records were also established during the trial trip for the volume of traffic handled by the radio telegraph system. David Sarnoff, vice-president, and G. H. Porter, general superintendent of the Radio Corporation of America, gave their personal supervision to the handling of the large volume of messages handled, which, largely because of the great amount of newspaper copy sent, was estimated at 15,000 words a day. Mr. Sarnoff said that there were more messages sent and received daily on the ship than are handled every 24 hours between the United States and any European country.

PURSE FOR ENGINE MEN

At an evening entertainment on June 24 the guests on board contributed a fund of \$5,932 to be distributed under the direction of Mr. Lasker among the officers and crew of the engine room.

Farmers-Manufacturers Conference at Cincinnati Pledges Support for Merchant Marine Campaign

THE Middle West Farmers-Manufacturers Conference held at Cincinnati, Ohio, on June 28 and 29 has developed the fact that all classes of our people believe at America should have its own merchant marine. There is, however, a difference of opinion as to how this great object can be accomplished but there can be no doubt that the best way to iron out these differences is to get the representatives of commercial, farming and manufacturing organizations together around one table.

Among the speakers who addressed the conference from the standpoint of the shipping industry were E. C. Plummer of the Shipping Board, Winthrop L. Marvin of the American Steamship Owners' Association, N. O. Pedrick of the United States Ship Operators' Association and Frank J. Shipman of the American Marine Association. Mr. Shipman invited the conference to attend the American Marine Congress to be held next November in New York and this invitation upon the motion of Matthew Hale was accepted.

The principal speeches by representatives of the Middle West were made by Senator Pomerene and O. E. Bradfute, president of the American Farm Bureau Federation.

Senator Pomerene said, "Let the chambers of commerce, manufacturers' and farmers' associations study this problem and pass resolutions and then tell their congressmen what

they want and it will come to pass. We must never again be in the position that we were when the Great War broke out."

Mr. Bradfute said that it was only recently that the farmers had been invited to sit at the council table in maritime matters. He believed that the farmers would support the merchant marine and declared that there were no class of men more loyal to American institutions. He pointed out that the membership of the organization he represented was composed of over one million farms and that they had a system of obtaining, in a very short time, the consensus of opinion of their membership on any subject through the questionnaire system.

RESOLUTIONS ADOPTED BY MIDDLEWEST FARMERS-MANUFACTURERS CONFERENCE

It is hereby declared to be the purpose of the Middle West Farmers-Manufacturers Conference to develop the foreign trade of the Middle West, through education, conferences and the co-ordination and co-relation of the various agencies, such as manufacturers' associations, farmers' organizations and chambers of commerce now studying the subject through their several traffic committees, which studies are necessarily either local or related to a single industry, to the end that the Middle West may participate in the foreign trade of the nation to the fullest extent and upon equality of opportunity so far as that is possible.

Our distance from the sea being approximately a thousand miles greater on the average than any nation with which we compete,

and our own seaboard markets nearer to foreign markets in point of freight costs than much of our own territory, transportation becomes a major purpose of this conference.

The development of seaways that will move the sea base inland, or inland waterways that will furnish routes of low resistance costs to the sea base, are of especial concern to this conference.

We stand unreservedly for an American merchant marine, without subsidy, as an indispensable link in our delivery system. And in the place of subsidy we submit the following as offering a probable solution of the problem and recommend its most careful consideration:

1. A system of preferential customs duties on goods carried in American ships.
2. A system of preferential rail rates for goods and passengers carried in American ships.
3. A system of preferential tonnage dues for American ships.
4. Allowing our railroads to apply export rates on materials used in the construction of American ships and on supplies used therein.
5. Laws compelling American officials traveling at Government expense to use American ships.
6. Laws providing that a certain percentage of our immigrants be carried on American ships.
7. Such other preferences for American ships as may result in benefit to the American shipper and may secure closer cooperation between the American shipper and the American merchant marine.

Our ocean transportation should be thoroughly co-ordinated with our inland transportation system, through the establishment of through joint rail and ocean freight and passenger rates from the Middle West to foreign markets. In this way only can the shipper in the interior know the actual cost of his goods delivered in those markets.

Our shippers of the interior should be allowed to file their export declarations at the custom houses of the cities where shipments originate.

We emphatically urge the Shipping Board to postpone any radical change of policy until Congress convenes and until the people of the country have an opportunity to express their views regarding additional merchant marine legislation. And we urge the Shipping Board in the meantime to work out some plan of operation through private steamship companies, fair to the Government, shippers and to the companies, which will enable those companies to buy the ships as soon as shipping conditions permit and as soon as additional legislation is secured.

We further recommend the following resolutions:

BE IT RESOLVED, that, we favor an equalization of export rail rates to all ports from the Middle West, and of import rail rates from all ports to the Middle West, to secure additional outlets to the sea and to make all of our seaports available to the Middle West on equal terms.

BE IT FURTHER RESOLVED, that, we favor the establishment of lower ocean rates to and from South Atlantic and Gulf ports where distance favors those ports, as long as lower ocean rates from or to North Atlantic ports are in effect where distance favors North Atlantic ports.

BE IT RESOLVED, that we are opposed to a monopoly in shipping, whether it be an American monopoly or a foreign monopoly, and we quote with approval the anti-monopoly clause of the Administration's recent Shipping Bill:

"It is hereby declared to be the policy of Congress to discourage monopoly in the American merchant marine, and, in pursuance of this policy, the Shipping Board is directed, in the development of its sales and its assignment policy, to continue as far as possible and practicable, subject to the provisions of this section, all existing steamship routes and regular services, and to endeavor in every way to bring about the permanent establishment of such routes and services, and their retention, as far as possible, in the hands of persons having the support, financial and otherwise, of the domestic communities primarily interested in such routes and services."

BE IT FURTHER RESOLVED, that we are opposed to any curtailment of the existing trade routes as a thing calculated to restrict our outlets; to congest our traffic in a few ports and upon a few railroads leading to those favored ports; and to increase car shortage, and;

BE IT FURTHER RESOLVED, that, in our judgment the time has not arrived when the capital of the small American investor can be profitably or safely invested in American flag ships, and, therefore, we believe that the forced sale of American flag ships at this time will have the effect of gradually driving this vast tonnage of shipping into the hands of selfish monopolies which will use the tonnage with an eye single to profits and without thought of the development of American agriculture, manufacturing and commerce, and;

BE IT FURTHER RESOLVED, that, we urge the President and the Shipping Board to do everything to encourage the retention and

the ultimate purchase of the new trade routes by "persons having the support, financial and otherwise, of the domestic communities primarily interested in such routes and services"; thus carrying out the spirit and the letter of the Merchant Marine Act of 1920 which very definitely contemplates the ultimate purchase of the new trade routes by independent local companies and not by shipping monopolies controlled by and interested primarily in other ports.

Shipping Board Prepares for Government Operation

THE United States Shipping Board, having failed to receive satisfactory bids for any considerable number of its ships, has begun the preparation of plans for direct government operation of its fleet. At a meeting held on June 4 the board adopted a resolution appointing a committee consisting of the chairman, the vice-chairman and Commissioner Thompson to prepare a plan to be submitted to the board "with a view to the formation of such companies or organizations, to be owned and controlled by the Shipping Board, as it may ascertain to be necessary for the purpose of operating sufficient vessels to fully cover world trade routes under the American flag consonant with the greatest possible economy and efficiency in direct government operation."

Chairman Lasker, who retired on June 19, will be succeeded on the committee by the new chairman, Edward Farley. During the period of the study and until the plan evolved has been adopted by the board, operations will proceed through managing agents as at present. It is the hope of the board, however, that the new plan will soon be fully operative, as in principle many of the details have already been developed.

Commissioner Lissner reported to the board the results of the negotiations had in New York by the committee representing the board in connection with bids for routes now operated by the government and said that but three or four promising bids remained. The board instructed the committee, together with the chairman, to continue the negotiation, so that when the new plan is determined upon the board will know just which of its lines, if any, are to pass into private hands.

The bids which have been considered by the committee included one from Norton, Lilly and Company, for certain vessels operating from New York to the east coast of South America; the Argo line for two ships between New York and the United Kingdom and the Pacific coast; the Orient, the Columbia Pacific for twenty ships from the Pacific coast to the Orient; Mayor Rolph of San Francisco and associates for ships between San Francisco and Australia; the Robt. Dollar interests for ten passenger vessels between the Pacific coast and the Far East; the Pacific Mail for five ships operated out of San Francisco, and W. R. Grace and Company for two ships to the west coast of South America.

RETIRING CHAIRMAN OF SHIPPING BOARD REVIEWS HIS ADMINISTRATION AND MAKES RECOMMENDATIONS

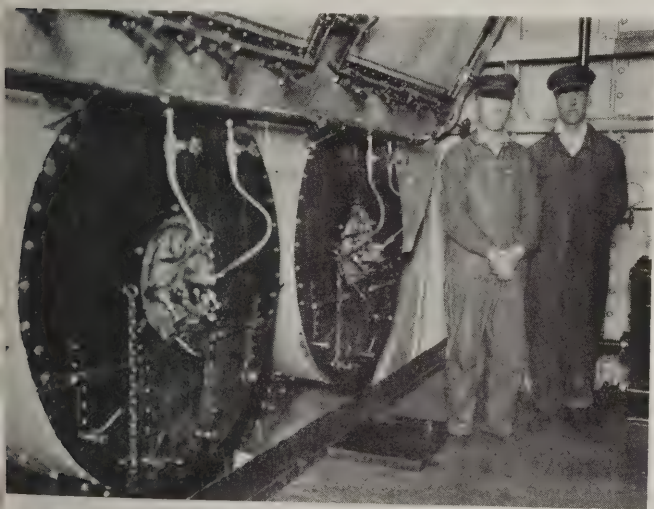
In a letter to President Harding, announcing his retirement as chairman of the United States Shipping Board, Albert D. Lasker has given a report on the accomplishments of the board during the two years of his chairmanship. Among the achievements Mr. Lasker mentions are the settlement at 12 cents on the dollar of claims aggregating \$20,000,000; the bringing of the Emergency Fleet Corporation out of chaos into an economic, efficient and distinct entity; the reduction of its deficiency from \$16,000,000 a month to \$4,000,000 a month; the development of commerce through the operation of American ships and the disposal of surplus real estate and materials. At the end of the current fiscal year the Shipping Board would have on deposit in the

Treasury, Mr. Lasker stated, \$125,000,000, as against a total cash reserve of \$4,000,000 it had when Mr. Lasker took office. After reviewing the administrative work accomplished, Mr. Lasker made recommendations concerning the proposed government operation of America's merchant marine in the event the negotiations for the sale of the fleet to private American individuals are not successful.

Mr. Lasker said that since the failure of the subsidy bill and as it appeared that most of the bids for the government fleet would be inadequate, the only apparent alternative is to "go the full length of direct government operation," but always with a view to ultimate sale to private owners. In the event of failure to sell the ships on an adequate basis, therefore, he recommended the creation by the Emergency Fleet Corporation of 12 to 18 subsidiary corporations to operate the existing freight lines, with about 250 ships; the use of approximately 200 remaining ships as a reserve, some of them to be equipped with Diesel engines and allotted to the operating companies; the sale of the other ships at the best prices obtainable and the scrapping of those for which the board is unable to find a purchaser at home or abroad.

Hudson River Day Line Steamer *De Witt Clinton* Converted to Oil Burner

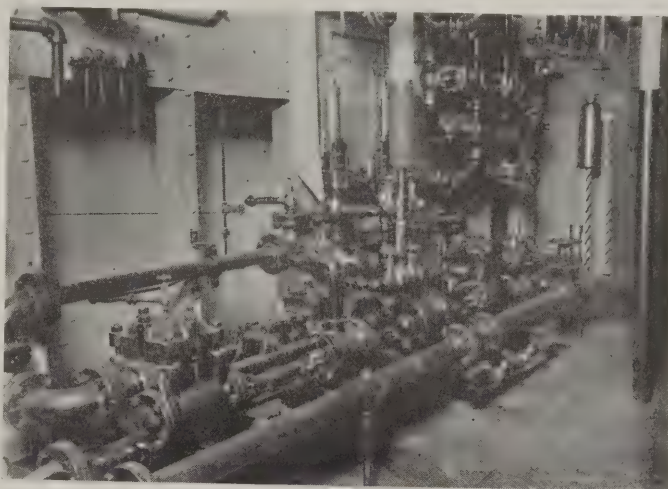
BEFORE entering her regular service this summer the Hudson River Day Line steamer *DeWitt Clinton* was converted from a coal to an oil burner. The vessel is a twin screw steel steamer of 3,539 gross tons, propelled by two four-cylinder triple expansion engines, each developing 2,243 indicated horsepower, supplied with steam



Oil Burning Equipment on One of the Boilers. At Right (from Left to Right) Are Chief Engineer R. G. Siter and Second Assistant Engineer Robert Tell

185 pounds per square inch by six 2-furnace Scotch boilers, working under Howden's heated forced draft and having a total heating surface of 12,417.6 square feet. Peabody oil burning equipment of the most improved type was installed in the engine room staff of the steamer, the tanks for carrying the oil fuel being installed by W. & A. Fletcher Company. The oil burning equipment, supplied by the Peabody Engineering Corporation, New York, comprises, in addition to the Peabody-Fisher wide range burners and their necessary piping, two Dean horizontal duplex oil pumps, 6 inches by 6 inches by 6 inches, two Griscom-Russell straight tube five-gallon oil heaters (either set being of sufficient size to handle entire load) and a 3-inch suction and a 2-inch discharge line both of the duplex type.

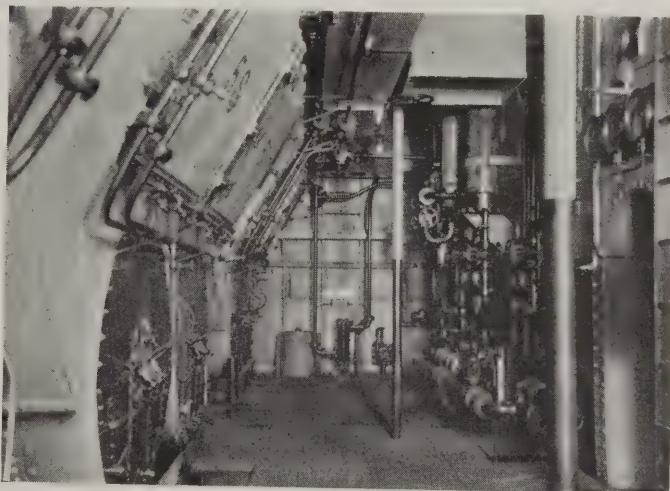
The special feature of this installation is that it maintains the good points of the Howden heated forced draft system while it avoids the objectional feature of using, when



Duplicate Sets of Oil Pumps Are Installed

burning oil, the cast iron fronts designed for coal burning, in which the air is unevenly distributed. In this case the Howden coal fronts were removed and the latest type Peabody double ported registers were fitted, with an outer casing connecting directly with the hot air ducts leading from the Howden heaters, thus using the desirable features of the Howden system, while avoiding the undesirable points.

This arrangement gives a double control of the air to the burners, which can be very accurately adjusted. As the Peabody-Fisher wide range burners, fitted with their central control valve, were installed in this case, the engineer has absolutely under his control the handling of both air and oil so as to give the best results in regard to the amount of oil



General View of After Boiler Room

consumed and the power developed. This was well demonstrated on the recent trial trip of the vessel, when the ship was brought from full speed ahead to a stop and the steam pressure was maintained without blowing steam, changing tips or putting out fires, no smoke showing during the change. This arrangement also gives ready means of running the vessel under natural draft, when it is not desired to operate the blower fan.

This installation was laid out by Mr. E. B. Sadtler, of the Peabody Engineering Corporation, and carried out by Chief Engineer Russell G. Siter, of the *S. S. DeWitt Clinton*, and his able assistant, Mr. Robert Tell.

America Will Fight for Place on the High Seas

Nothing Will Be Overlooked in Training Our Merchant Marine to Meet Aggressive Foreign Competition on an Even Footing

By "Old Scotch"

WE are passing through a momentous period for the future of Mr. American Merchant Marine. The industry is somewhat "groggy" from what looked to be a knockout blow, when Congress failed to do anything constructive for our champion, and left us groping around in a dazed condition to get up steam and energy enough to make a further attack on our old opponent, Mr. Aggressive Foreign Shipping. We are gradually wiping the blood out of our eyes, getting back our breath, and sparring around the ring for another opening.

Things look rather squally at the present writing and unfriendly "bookmakers" (editors of foreign shipping papers) are offering odds against our ultimate success in this prize ring of shipping on the seas. Our Uncle Samuel, while unwilling apparently to give us any life-inspiring oxygen treatment, is delivering to us the ultimatum that, if we do not resume the battle on our own strength alone, he will step in the ring himself for a round or two, and show us how to battle.

GOVERNMENT OWNERSHIP NOT THE FINAL ANSWER

Of course, Uncle Sam has a couple of brass knuckles on his fists, in the shape of a strong Treasury behind him, but such, while it lasts, is not teaching us the game of fighting. Besides that, the spectators who put up the coin for Uncle to battle with are a fickle bunch, like all other gatherings at sporting events, and at a critical time are liable to yell "Take him out," if he wabbles a bit in the encounter.

Naturally, rather than to see the fight called off entirely, we are willing to see Uncle do the fighting himself, at least until our breath is fully recovered, and we can take off a little more of the extra weight we have been carrying, and be able to get back in the ring ourselves for another try for the championship. As the gate receipts for events of this kind are very lean just at present, we had better bestir ourselves to getting in better condition, while Uncle keeps our opponents busy with his brass knuckles.

AMERICAN SHIPPING MEN WILL "CARRY ON"

No, we are not discouraged, and we haven't lost sight of the prize for which we are battling. This extra weight we are carrying can and will be worked off before we again tackle our enemies. When Uncle lets us take our place in the ring again, we would like a few cheers from the ring-side, as nothing helps so much in a fight of this kind as to know that your own gang is with you.

Our seconds and trainers have outlined very good methods of training to reduce our surplus weight, and to harden up our muscles. The training process prescribed is now going merrily along on all sides. Already plans are in process for unloading the greatest part of our excess weight, in the shape of the great fleet of idle ships that stand as a menace to the real competition we are about to enter. Uncle has charge of this part of our weight reduction, and, if rumors be true, a very considerable portion of the laid up fleet is to be "scrapped" or "canned" whichever way may seem best to accomplish the ultimate purpose.

PART OF IDLE FLEET TO BE CONVERTED TO MOTORSHIPS

Such of the fleet which represent good fighting muscles are to be retained and put on the firing line, backed for the time being by Uncle. Others whose muscles are somewhat flabby, due to bad digestive apparatus in the shape

of inefficient machinery, will have this defect remedied by the installation of Diesel engines, which will make of the real hardened muscular constituents of the fighting body of our merchant marine.

FUEL ECONOMY IMPROVING

The overweight of inefficiency in operation in existing ships now being used on the firing line is being reduced on all sides. The Shipping Board's fuel economy efforts are getting more and more in evidence: The training of men in the proper and efficient use of fuel oil is showing better results all along the line, as the number of graduates of the League Island School are being distributed throughout the merchant marine. These graduates not only show better results, as the direct effect of their intensive training, on the ships which they operate, but they are rapidly disseminating the knowledge which they have received to others with whom they are associated who have not received the benefits of the special training. This whole effort will harden up a most important muscle in our fighting body on the competitive seas.

COST OF REPAIRS BEING REDUCED

The cost of repairs has heretofore been a decidedly flabby muscle and a cause of much "overweight" in our fighting abilities. Very cheerful results are now being obtained from the increased skill and fighting spirit of the men who handle this particular branch of the training activities in hand. Fighting spirit appeals to the average American, and this being inculcated in our sea-going scrappers to a splendid degree, as each engineer has it impressed upon him that he must do his individual part in reducing repair costs, if our fighting merchant marine is to have a chance in the great international prize fight on the sea.

Inventors are rushing to the aid of our fighter, in the shape of improving the muscles in use by bringing out new ideas, for economizing in fuel consumption. Feed water heaters, superheaters, evaporators and economizers are receiving the most intensive study from the men who know most about these essentials to the economical use of fuel and the reduction of repair costs.

In training a fighter of the type we want our merchant marine to be, it is not always best to take too much consideration of the first cost of essentials of this kind, as it results we are after. High cost apparatus which greatly reduces the daily cost of operation is oftentimes a very cheap investment to make. In training a human fighter for a contest involving tremendous stakes, as modern fistic encounters do, just note how little heed is paid to the first cost of such essentials as the best quality of food or training apparatus to put the scrapper in shape for the great event. Results alone count when you are out to accomplish a definite object, whether in fistic encounters or in its parallel contest for a right to conduct a good part of our own commerce on the seas.

As this is to be a "gruelling" contest, as sport writers usually say, the preparation of our champion must be thorough and begin with the elementary essentials.

MARINE STANDARDS COMMITTEE TO ELIMINATE WASTE

The American Marine Standards Committee suggested by Uncle, through his Department of Commerce, is now launched and ready to begin its part of the training process.

The general idea that this movement was to be conducted by our Uncle as one of his contributions to the preparation of our fighter is entirely erroneous. Uncle's function in this matter is merely to wave the fan and encourage the fighter between rounds. Its sole purpose is to eliminate waste at the training table. Representatives of all the branches that are constructing our fighting merchant marine are to get together and by mutual conferences prepare standards for all details, which lend themselves to standardization, and in this way to reduce some of the "overweight" entering into the shipping body.

This training phase is also to extend to the handling of the fighter after he goes into the ring. All waste motions must be eliminated in looking after our sea pugilist between rounds, which corresponds to the times when the ships are in port. These periods must be given the best and most efficient attention, so the A.M.S.C., through that branch of its activities, has enlisted some of the best talent in the country to cut out waste and standardize our activities while the ships are in port. If they are handled properly and expeditiously, they will be freshened up for the real fighting in each succeeding round.

EXPERIENCED COUNSELLORS AT HAND

At all ringsides it is usual to have experienced men, who themselves have long engaged in fistic encounters, to counsel and advise the active participant in the fray at hand. In

our sea-fighting contest we must have such counsellors to aid us, drawn from the ranks of the experienced in the fighting game. We do not have such a large number from which to choose, but, such as we have developed in the small fights we have been through will make up for quality in what they lack in numbers.

When we are all set for the fray, as we must be at no distant date, if Uncle succeeds in holding off our opponents while he is temporarily occupying the ring, our champion will go in for the fight of his lifetime. The fight is already being widely advertised. The battling ground is chosen, the seconds and trainers are working hard to get their men in shape. The stakes are enormous, and are measured in millions of dollars. The world at large will furnish the spectators, and the American contingent at the ringside will have to be well organized to cheer on their champion, as each one present is vitally interested in the results. International rules will govern the contest, and there must be no foul blows resorted to by either contestant.

Secure your tickets early for the world's greatest contest between Mr. American Merchant Marine, the young champion of the Western Hemisphere, and Mr. Aggressive Foreign Shipping, the victor in many hard-fought contests heretofore.

Will young fighting blood bow to this hardened old fighter of the seas? Is the question to be answered.

We'll say NO.

An Analysis of Claims of the Electric Drive Over the Geared Drive

By J. C. Shaw*

VARIOUS articles and papers have been published and read, from time to time, in the technical press and before the different societies advocating the steam-electric drive for marine propulsion. These have been conspicuous for the scarcity of any real figures to substantiate the claims for the superiority of this drive, the data being mostly theoretical, and based on assumptions generally better known to the authors.

An excellent example of one of these articles is that which appeared in the May issue of MARINE ENGINEERING AND SHIPPING AGE by Messrs. Watson and Thomas, of the General Electric Company, entitled "How to get a Shaft Horsepower for All Purposes with Steam on from 0.75 to 1.00 pound of Oil."

They have entirely begged the question, as they do not inform the readers any details as to 'how' this is to be accomplished. They present the usual theoretical curves for economy, consisting in this case of water rates and oil consumptions for all purposes per shaft horsepower as ordinates and normal shaft horsepower of the vessel as abscissæ, the power varying from approximately 3,000 for the cargo ship to 22,000 for a liner.

Two sets of curves are shown, based on 200 and 250 pounds steam. The article is also illustrated with pictures of the electric driven ship *Independence*.

In the June number of MARINE ENGINEERING AND SHIPPING AGE, furthermore, there is given the specification of a proposed liner of 10,000 shaft horsepower in which the electric drive is proposed to be used, the oil consumption being here stated as 0.85 pound for all purposes per shaft

horsepower, but which figure is also seriously to be questioned.

Thinking that readers of MARINE ENGINEERING AND SHIPPING AGE would be particularly interested in some actual figures obtained in service with the electric drive, in contrast to what has been published for advancing its cause by its advocates, the author presents that which follows:

VESSELS EQUIPPED WITH ELECTRIC DRIVE

The electric drive has now been installed in five vessels belonging to the Shipping Board and has accordingly been given a thorough tryout for this particular service by competent operators. Several battleships in the United States Navy have also been built, employing the electric transmission, and it can be unreservedly stated that the actual results for either type of vessel, which are now available, fall far short of the claims made by its sponsors.

The five Shipping Board vessels referred to are the *Eclipse*, *Independence*, *Archer*, *Victorious* and *Invincible*—the *Independence* being used, as previously stated, to illustrate the article of Messrs. Watson and Thomas. These vessels originally had geared turbine machinery, which proved unsatisfactory in service due to defective gearing.

These vessels have a length of 440 feet between perpendiculars, a beam of 56 feet and draft of 28 feet 7 inches, corresponding to 15,700 tons displacement. The block coefficient, which is 0.68, is unusually fine, and the vessel is accordingly suitable for considerable more speed than the original designed speed of 11 knots, corresponding to 3,000 shaft horsepower with propellers running at 90 revolutions per minute.

The old geared turbine, of General Electric type, con-

*Assistant to chief engineer, The William Cramp and Sons Ship and Engine Building Company, Philadelphia, Pa.

sisted of five stages, operating at 3,600 revolutions per minute and driving through a single pinion double reduction gearing. This turbine was replaced by one of the same general design, but having no reversing wheels and incorporating more stages and other improvements tending to better the thermal efficiency. The later turbine is coupled to a generator rated at 2,360 kilowatts, which supplies three phase current at 2,300 volts to an induction motor rated at 3,000 shaft horsepower, running at 100 revolutions per minute and direct-connected to the original shafting. The blades of the propeller were set to the minimum pitch permissible, for favoring the installation of the motor, which was limited as to diameter and corresponding maximum number of poles that could be employed, the designed revolutions being increased from 90 to 100 revolutions per minute for the 11 knots.

The boilers, which are Scotch with Howden draft, are the original, but superheaters of the Schmidt types were added to give approximately 200 degrees superheat, which, with the more improved design of turbine, was expected to more than counteract the inherent electrical losses, calculated as not over 10 percent, with 80 percent power factor. The latter, however, works out in service about 70 percent, reducing thereby the effective capacity of the generator with a corresponding increase in the I^2R loss due to the wattless current.

PERFORMANCE OF THE ECLIPSE

The first of these vessels to be converted was the *Eclipse*, which was put into service the early part of 1921, and the following data were obtained on the maiden voyage, initiating the new drive:

Total distance, nautical miles	23,611
Mean speed, knots	9.78
Fuel consumption	33.2
Shaft horsepower	2,422
Pounds of oil per shaft horsepower	1.28
Superheat, degrees	198
Boiler pressure, pounds per square inch	214
Chest pressure, pounds per square inch	189

The conclusion reached by the operating company as a result of their experience with the vessel on this voyage, which was arrived at by comparing results with a voyage made before the vessel was changed to electric drive, was that the consumption was increased by 10 percent over that of the original gear drive. Furthermore it was estimated that had the new installation not been equipped with the superheaters the fuel consumption for the electric drive would have been 20 percent more, instead of 10 percent.

Subsequent data obtained from the *Eclipse* in service, and her sister ships, substantially confirm this original unfavorable report, checking very closely the figures obtained on the first voyage of the *Eclipse*. These additional data are shown in Table I, which is made up from the ship's logs, taking the best portions of voyages uninfluenced by adverse weather conditions. The light draft operation of the vessels have been eliminated, and only those portions approximating normal draft conditions have been employed for the general averages shown in the last column. The third column has been inserted to show the effect of draft on speed and economy for the *Independence*. The averages for power and revolutions are arrived at by multiplying same by hours and dividing by total hours. The average power, it will be noted, is 2,396 shaft horsepower, corresponding to 9.92 knots, and which is estimated 10 percent too high for the particular speed. This poor propulsive efficiency is no doubt due to the high turns of the propeller employed to favor the motor, as previously stated.

Comparing the above results with a modern compound marine turbine, using saturated steam, the oil consumption per shaft horsepower is about 30 percent greater for the electric drive using superheated steam. This is based on 1

pound of oil per shaft horsepower, which is easily being realized in service with the first drive with properly coordinated auxiliaries. Using the same degree of superheat the difference in favor of the geared drive would be still more marked, based on the same propulsive efficiency for either drive.

RESULTS WITH ELECTRIC DRIVE ON NAVAL VESSELS

Referring to the results that have been obtained in the Navy with the electric drive, as compared with the geared drive, this is best seen graphically in Fig. 1. Curves "A" and "B" for the battleships *California* and *Tennessee* are seen to have the same general characteristics, though m

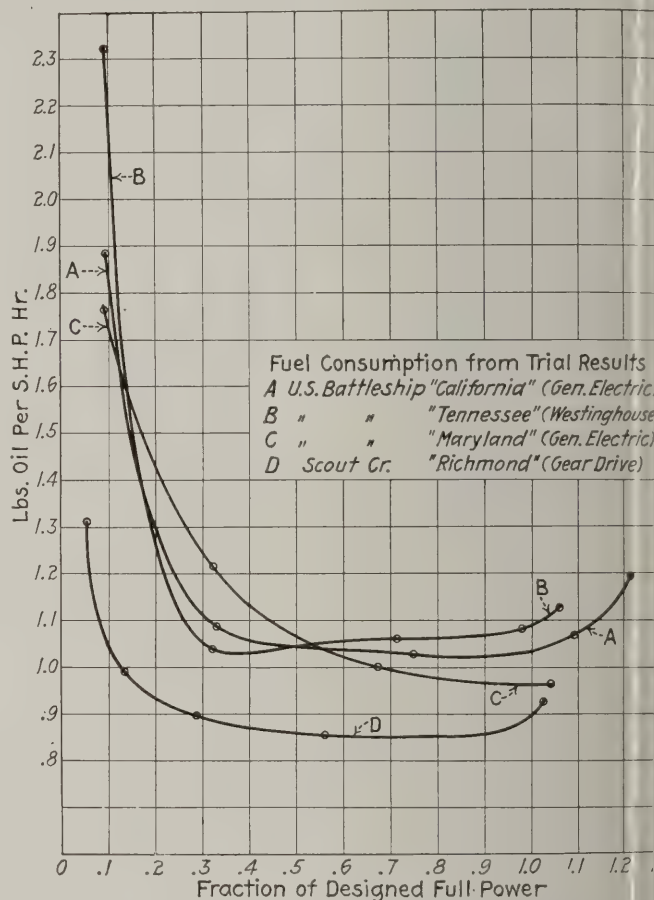


Fig. 1.—Comparison of Fuel Consumptions for Electric Drive and Geared Drive, Based on Fraction of Designed Full Power

NOTE—Designed power: battleship, 28,500; scout cruiser, 90,000. Battleships use superheated steam, scout cruiser saturated steam.

chinery was supplied by the two independent electric companies interested in this drive. Curve "C," shows the consumptions for the *Maryland*, and is from the only battleship trial data; showing oil consumptions, published heretofore regarding these vessels. It is to be noted that it has an entirely different characteristic to the other two curves, which is apparently due either to the method of measuring the oil or not including all the auxiliaries in this measurement.

The battleship has two screws and two turbines, while the scout cruiser has four screws and four sets of turbines with a boiler room separating the forward and after independent engine rooms. The scout cruiser is accordingly equivalent to two battleship installations of 45,000 shaft horsepower, and comparable with the present battleship installations of approximately 30,000 shaft horsepower.

Comparing the results of the scout cruiser, shown by curve "D" with the mean of "A" and "B," it will be observed that

TABLE I—PERFORMANCE OF ELECTRIC DRIVEN SHIPS

Voyage Route	Eclipse—Independence—Archer—Victorious					Average for A-B C & D
	Eclipse	Independence		Archer	Victorious	
	No. 2 (A) Savannah to Otaru via Panama and Honolulu 28' 8"	No. 2 (B) Balboa to Yokohama via Honolulu 24' 10 1/2"		No. 2 (C) New York to Yokohama via Panama & Yokohama 28' 8"	No. 1 (D) Cristobal via Yokohama Honolulu 28' 3"	
Mean draft	15,950	13,748	12,325	15,665	15,605	15,450
Mean displacement (tons)	1,062.25	787.61	809.97	1,014.9	820.7	3,685
Total hours (bar to bar)	9,894	8,235	8,630	10,316	8,081	36,526
Total distance, miles	9.31	10.58	10.67	10.17	9.85	9.92
Mean speed, knots	2,224	2,365	2,437	2,766	2,200	2,396
Mean S. H. P.	1,363	1,143	1,165.5	1,456.4	1,150	5,112
Fuel consumption at sea (tons)	30.8	34.87	31.6	34.5	33.6	33.3
Fuel consumption at sea, tons/24 hrs.	88	96.4	92.2	92.4	87.2	90.8
Mean R. P. M.	1,292	1,375	1,326	1,165	1,427	1,297
Mean lbs. per S. H. P.	210 #	205 #	203 #	214° F.	214° F.	214° F.
Boiler pressure	195° F.	195° F.	214° F.	214° F.	214° F.	214° F.
Superheat	27.5	28	28.4	28.4	28.4	28.4
Vacuum (inches)	7.26	7.20	7.4	7.08	7.03	7.15
Miles per ton fuel	309	311	303	316	319	313
Pounds fuel per knot						

electric drive requires, on an average, 18 percent more oil per shaft horsepower at full power, 22 percent more at one-half power, and about 90 percent more at one-tenth full power, the latter corresponding approximately to the 10 knots cruising speed of battleships. The scout cruiser is handicapped, furthermore, at full power due to the much higher rate of oil burned per square foot of heating surface, 80 percent of full power of the *Richmond* corresponding to about the normal full power condition of the battleships.

The foregoing, therefore, entirely disproves the most cherished claim of the electrical advocates, which is for higher economy at the reduced or cruising powers.

IMPROVED THERMAL EFFICIENCY OF GEAR DRIVE

The gear drive has certain inherent advantages for improved thermal efficiency, which are not common to the single unit turbine, as necessarily required for coupling to a generator. This is because the gear easily permits of cross compounding of turbine, thus permitting the turbine blading design to approach the ideal conditions for best efficiency.

At approximately one-half power for the cruiser, additional blading is cut in on the forward end of the high pressure turbine, and at one-quarter full power additional blading is put into action. These additional groups of blading carried are designed for maximum efficiency for the particular power and speed at which they are put into operation.

For the cruising speeds of 20 knots and under, a special high speed cruising turbine is employed in each engine room, coupled to the forward end of one of the high pressure turbines through additional gearing. These take the high pressure steam first, exhausting to the forward ends of the high pressure turbines, or the one-quarter power belts. It is for this reason principally that the scout cruiser at one-tenth power actually shows about the same economy as the electrical battleships at full power. The inherent electrical losses, due to the electrical transmission, are given as 10 percent at full power and 20 percent at one-tenth power, which latter is used on one-half the power plant in operation for favoring economy at this speed.

Advocates of the electrical drive have also frequently made other claims besides that of economy, as, for instance, greater liability with freedom of troubles, greater flexibility of drive and simplicity of control than that with the geared turbine arrangement. These are far from being the actual case.

RELATIVE RELIABILITY, FLEXIBILITY AND SIMPLICITY OF THE TWO DRIVES

The William Cramp and Sons Ship and Engine Building Company has built at the present time over a million horsepower of geared turbines without once encountering gear trouble, and other experienced marine builders can testify to the same experience.

As to the cargo ship arrangement having the electric drive, in which there is only one turbine coupled to generator and the one motor driving propeller, if there is trouble with any one of the units, the vessel has to be completely stopped. It is for this reason alone that many experienced shipowners will not consider the electric drive, and for the same reason it is looked on with disfavor by the underwriters. This is not so with the single screw compound geared turbine arrangement, which, in case of damage to either high or low pressure turbine, or their respective pinions, is only one-half as likely to be put entirely out of commission, special piping being provided for permitting either turbine to operate in such a contingency.

The electric drive has other well known disadvantages not common to the steam drive.

OPERATING DEFECTS OF ELECTRIC DRIVE

There are the necessity for having a specially trained engineer force, the liability of short circuits in the windings on account of moisture, the ever present danger with the high voltage employed and the defects of the induction or synchronous motor when used for this service.

At the present time there is a leaning toward the synchronous motor by the electrical experts, due to the induction motor's small air gap, and the all inductive load it imposes on the generator with resultant low power factor.

The synchronous motor, however, requires a more complicated starting gear and is more prone to fall out of step when much overloaded. This latter operating defect is particularly apt to occur in rough weather with the cargo ship, in which the power is small in proportion to the displacement, when there occurs a large variation in the torque. In case of two screws, or more, driven by motors supplied by current from a common alternator, the screws are locked together by the synchronous speed of the generator. This makes for bad maneuvering and it is for this reason that the electrically driven battleships require that both generators be in operation when making port, which is so that each motor will have its independent source of power.

The claim for greater simplicity of control for the electric drive is far from being correct, as shown by the multiplicity of levers, switchboard instruments, rheostats, synchronizing devices, etc.

Other arguments that have been made against the gear drive for advancing the cause of the electric drive are that there are losses due to the astern turbine being rotated idly when going ahead, lack of ability of the astern turbine to develop the full ahead power, and the possibility of trouble with astern blading when high temperature steam is admitted to it suddenly.

The first of these can be dismissed by pointing to the low oil consumption on the scout cruiser and similar vessels.

(Continued on page 434)

Applications of Arc Welding to Ship Construction

By E. H. Ewertz*

Those who have been interested in the applications of welding in the above field, have for a long time felt the need of a digest of the available literature and unpublished existing information. This need was recognized by the Electric Arc Welding Committee of the American Bureau of Welding and with its cooperation Mr. E. H. Ewertz has prepared such a review. The report includes a summary of the present applications of welding as compared with riveting, a description of the arc welded ships already in existence and their performance, a review of the repairs to the German liners and the results of tests in England and the United States to demonstrate the adequacy of welding as applied to ship construction, a description of the several designs of welded ships, a comparison of the advantages of welding versus riveting and finally a bibliography. It is needless to say it is the most complete summary available on this subject. It was prepared for the use of the ship designer, the draftsmen and those interested in the application of welding in this field. We trust that those interested will find it useful.

C. A. ADAMS,

Director, American Bureau of Welding

THE design and construction of a ship presents problems of such diversified character and stresses so difficult to define, that, today, the past practice and established rules of various organizations govern the design of a ship both as a whole and as to details. Therefore, new principles of designs and joining parts together are slow at being adopted even though the marine engineer is convinced that by the use of such new designs he would be able to produce a stronger, more serviceable and a less costly ship.

Probably one of the most important new developments in ship construction is based on the use of electric arc welding for joining the various parts together. While such welding has already been applied extensively to the less important parts of a ship, we also have ships where electric arc welding has been used for the more important parts, known as the strength members of the ship. The ship classification societies, by whose rules designers and builders are largely governed, recognizing the merits of electric arc welding as applied to ship construction, have made and are constantly making tests and experiments, enabling them to issue from time to time additional rules, so that today it is possible to use electric arc welding for joining together practically all the parts of a ship.

ORIGINAL IRON SHIP CONSTRUCTION

In the early stages of iron ship construction, before steel manufacturers had conquered the process of rolling shapes, the iron plates forming the sides of a ship were reinforced by framing made up of flat iron bars, fitted on their edges against the ship's sides and held to the plates by means of flat U-bent clips, having rivets in the flanged ends, and this established a T construction between the shell plating and flat bar.

This method of construction was naturally weak in that the connection between the two steel members, the flat bar and the shell plating, was not continuous and, therefore, when angles, channels, bulb angles, Z-bars and other such parts were obtainable, it was perfectly natural that such shapes should be adopted as they permitted riveting in the flange connecting the important members. Thus the bar and the shell produced the same T construction as was found on the earlier ships, but here rivets could be placed close together in the connecting flange of the shape, thereby making a practically continuous connection. However, a still better connection would be obtainable, if the flat bar was joined to the shell plating by welding, making the two members one.

*General manager, Moore Plant, Bethlehem Shipbuilding Corporation, Ltd., Elizabeth, N. J.

Welding by heat is now used extensively in some of the important parts of a ship, such as forgings for stern posts, rudder frames, main engine parts and also in forming off sets and bends in angles as well as in many other details. Welding in some cases may even be found in the ship plating. All such welding has an element of uncertainty connected with it and, therefore, in calculating the strength of such welded parts, a large factor of safety is allowed to protect against failure. Often it is desirable to weld parts that are beyond the capacity of the builder's facilities; then riveting or bolting has to be adopted.

Riveting, also, has its hazards, for heavy locked up stresses are produced in the driving of a rivet and stresses are set up in the plating nearby due to hammering. It is often impossible with the best workmen to obtain fair rivet holes and therefore rivets are frequently driven into odd shaped holes, adding uncertainty to the results obtained. While the testing of rivets is readily performed, it is frequently found in tests of compartments that the water produces an excessive strain on the rivets. Again, rivets having passed all the tests during the ship's construction are sometimes found incapable of standing stresses produced by the ship working in a heavy sea.

The vast amount of skilled labor required to properly form the various members of a ship's structure, to make an punch rivet holes, to bolt together and fair up the various parts, is labor that is little understood by the average engineer. The hazards, however, due to human incapability to produce perfect work are offset by the liberal margin of safety allowed for in the classification rules; therefore, we seldom hear of disaster to a ship due to faulty construction.

WELDING WOULD GIVE IDEAL CONDITION

That further application of welding to ship construction is desirable is evident particularly when we remember that the use of rivets was a method of construction that was made necessary on account of the lack of the proper facilities for further extension of welding of parts, and also because material for parts had to be made to a size suitable for manufacturing and handling. An ideal ship, however, would be made to what might be considered one piece, welding having joined all of the parts into one. But, in the future, as in the past, where the human element enters into the construction, a suitable margin of safety should be allowed for in the calculations and properly trained men as well as the right type of electric arc welding machines and suitable electrodes should be used.

Many tests of various natures have been made to establish

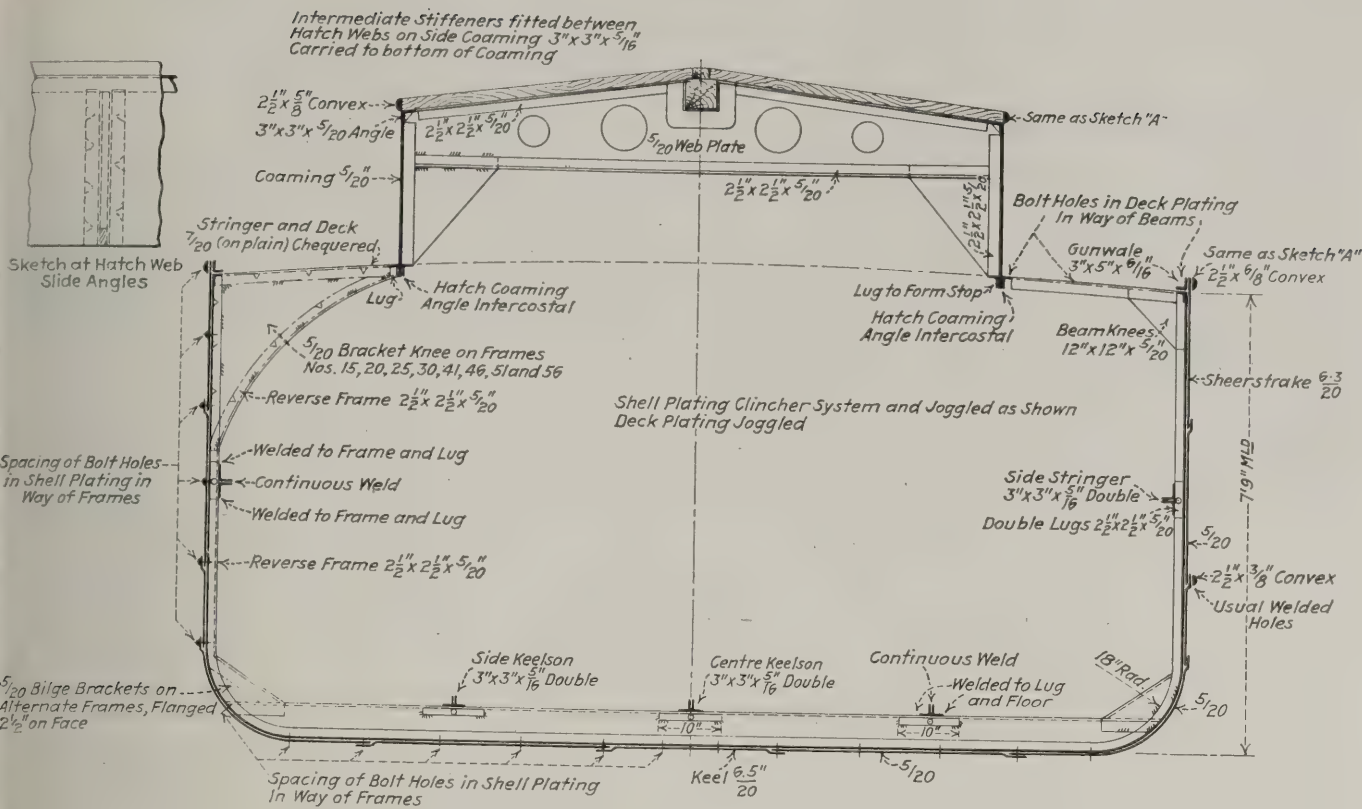


Fig. 1.—Midship Section of Cross-Channel Barge

standards that give equal or better connections between parts than that obtained by riveting or bolting. The Government and ship classification societies have joined with the American Welding Society and other similar bodies in the making of these tests, as well as testing electrical machinery, the material to be welded, and the material to be introduced into the weld—all have been subject to the most careful study and so we now have available data that are in some respects superior to the data used in the old form of construction. Even the problem of the human element has been

given careful consideration, and we believe it is now a lesser problem than the same element is in the old type of construction. Only a small portion of available data in connection with electric welding in ship construction can be given in this paper but further information can be obtained from the many papers referred to in the bibliography; however, before giving these data, we should consider what is now a past—the work of men of vision and determination, who applied electric arc welding in ship construction and, in doing so, gave us the necessary past now to build on.

THE DOROTHY M. GEARY

In 1915, Mr. Geary of the Geary Boiler Works of Ashtabula, Ohio, built a tugboat named the *Dorothy M. Geary*, having a length of 42 feet, a beam of 11 feet, and a depth of 6 feet 6 inches. She was constructed of steel, the shell plating being 3/16 inch, frames 1½ by 1½-inch angles, and bar keel 1 inch by 5 inches. The shell plating was riveted



Fig. 2.—Launch of Quasi-Arc Welded Vessel, A. C. 1320

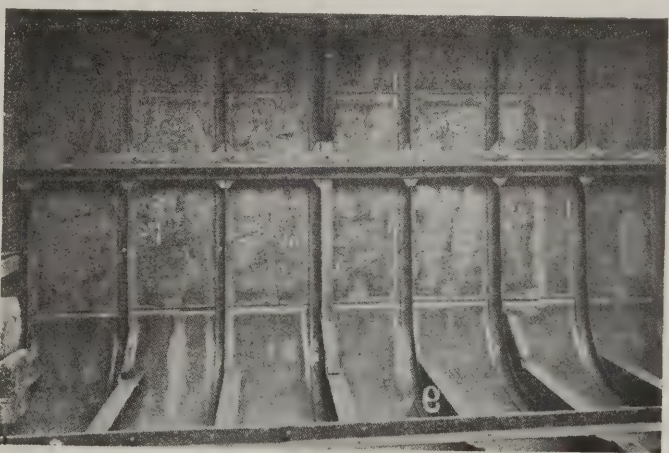


Fig. 3.—Interior View Showing Quasi-Arc Welded Frames, Floors, Stringer and Shell Plating



Fig. 4.—View Along Deck, A. C. 1320

to the frames and bar keel, but all other joints like ends and edges of plating as well as all other parts were welded by the use of Lincoln electric long arc welding machines, and bare, soft, steel wire.

This tug has been in constant service all the year around and often, in winter, has had to break her way through ice up to 8 inches in thickness. Once she was caught between two large ships and had her side crushed in 18 inches, raising her deck 6 inches. This damage was repaired by using hydraulic jacks to press the sides out to proper places, and neither these extraordinary stresses nor other service conditions have in any way started or cracked the welding.

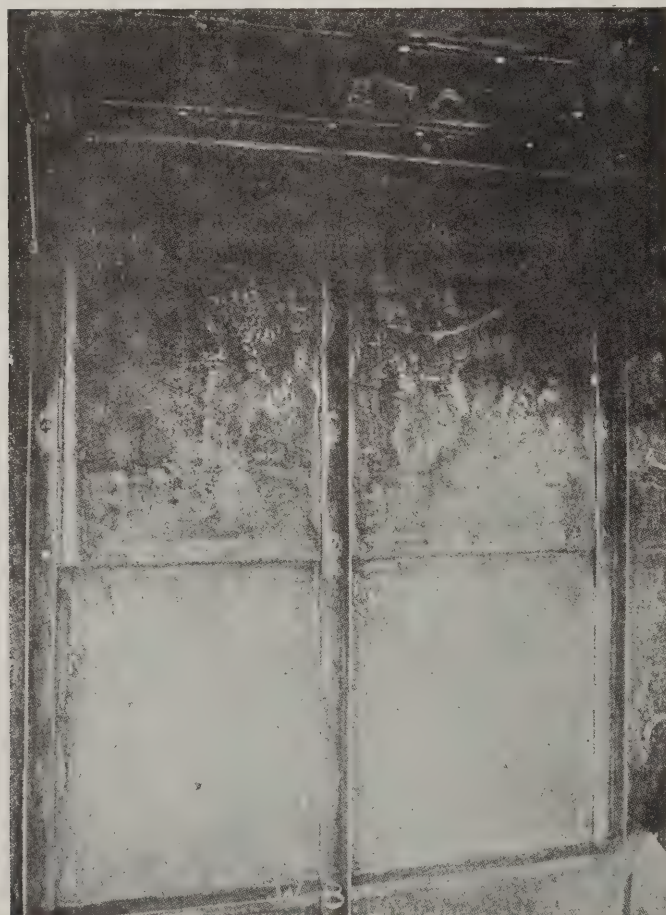


Fig. 5.—Watertight Bulkhead, Showing Quasi-Arc Welded Seams and Stiffeners



Fig. 6.—Electrically-Welded Coaster Fullagar, Built by Cammell Laird & Company, Ltd., Under the Quasi-Arc Welding Patents

The demand for ships during the great war advanced electric arc welding in a phenomenal way but, due to a lack of proper equipment and also to a lack of trained welders, much work was poorly done making many men prejudiced against this type of welding. Nevertheless, others judging from actual facts continued the process, and in January, 1918, the British Admiralty had constructed at Richborough an all electric welded cross channel towing barge, known as the *AC-1320*. This barge is probably the first all electric welded ship constructed up to that time.

THE AC-1320

The length of this barge between perpendiculars is 125 feet 9 inches, molded breadth 16 feet 4 inches, molded depth



Fig. 7.—Electrically-Welded Ship Fullagar, Floor Plates, Frames and Plating

7 feet 9 inches. She has a deadweight capacity of 200 tons. She has a curved stem with transverse stern and is fitted with two hatchways 42 feet by 10 feet. There are three transverse bulkheads, the fore and aft being watertight. Frames are 2½ inches by 2½ inches by 4 pound angles with floors of 7 inches by 3½ inches by 7 pound angles, and the shell and deck plating is 5/16-inch thick, tapering to ¼ inch at the ends. She is of the usual barge construction having a flat bottom and sides with four strakes of plating on each side, all joggled and lap welded.

During the erection the parts were held together with service bolts 10 inches or more apart, and after the welding was completed the service bolt holes were plugged and

emerged in a satisfactory manner. Last year she was in the service of the Port of Queensborough Development Company, Ltd., whose engineer, Mr. J. W. Bruce, stated after his examination: "This barge has been thoroughly tested by me recently and I find all strake welded laps and joints, frames, web frames, beams and half beams, and all welded parts are in excellent condition. This barge like others of the AC type, has been subjected to very rough treatment and heavy war service during the busy war period at Richborough. She consequently shows definite signs of same, but nevertheless remains in excellent condition and quite tight when loaded. Up to the present it has not been necessary to have any work whatever done to the hull or

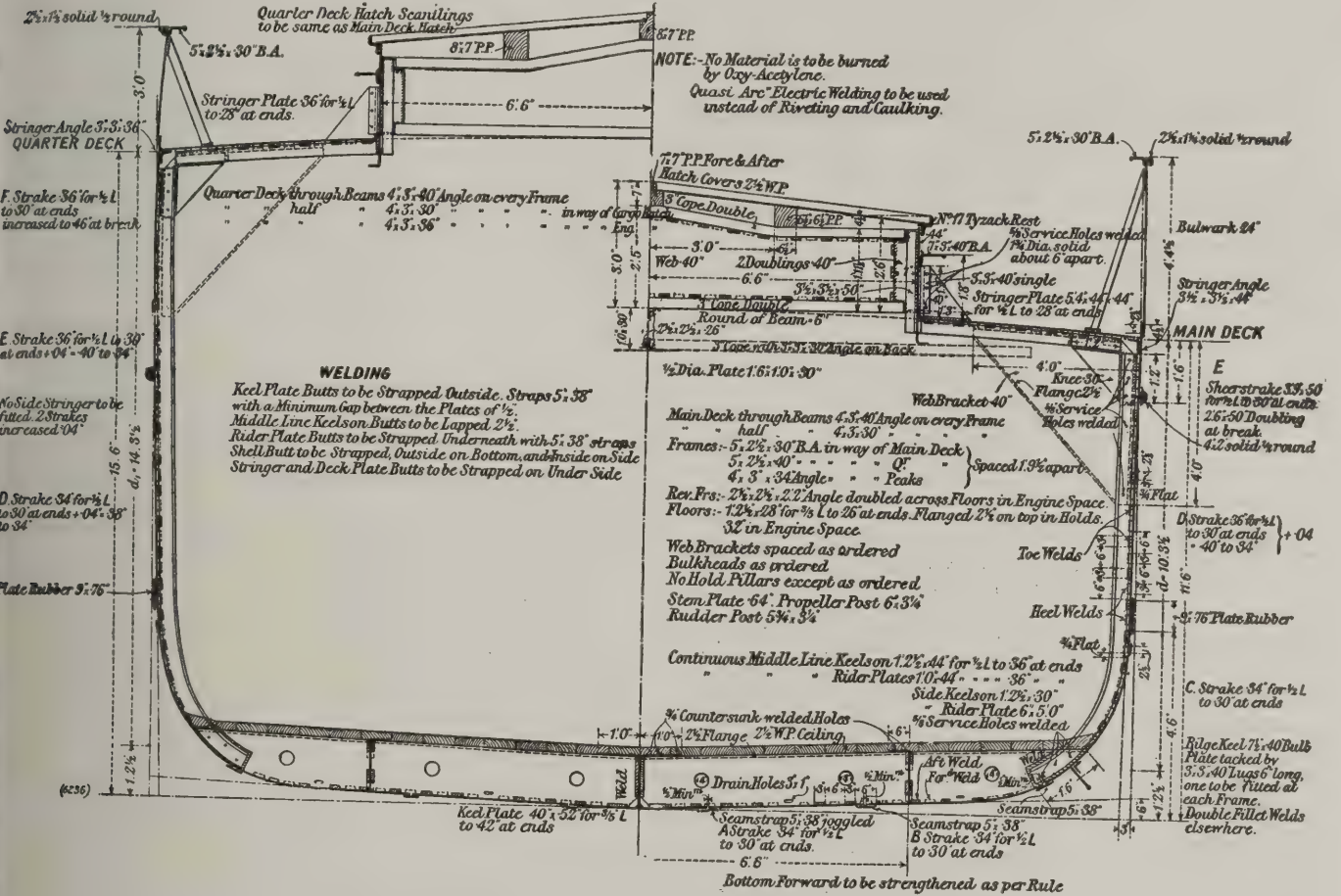


Fig. 8.—Midship Section Electrically-Welded Ship Fullagar

welded. All of the welding work was made with quasi-arc welding machines and their special flux covered steel wire was used throughout. Shell plates were joggled to simplify welding operations. All watertight bulkhead connections as well as the bottom plating were continuous welded both inside and out, all other watertight joints were welded continuous on one side and tack welded on the other. On the shell plating the continuous welding was on the outside in all cases. For internal, non-watertight joints and frame construction, tack welding was adopted sufficiently spaced to give a margin of strength over a similar riveted joint.

As is usual in ship construction, framing, bulkheads, and similar parts were assembled and welded on the ground before erection. A very good idea of the construction and appearance of this barge may be obtained by studying Figs. 1 to 8.

The cross channel service gave an excellent opportunity to test out this barge. She had hard usage, having been loaded to capacity with all kinds of war materials, and even unloaded a number of times, but in spite of all this she

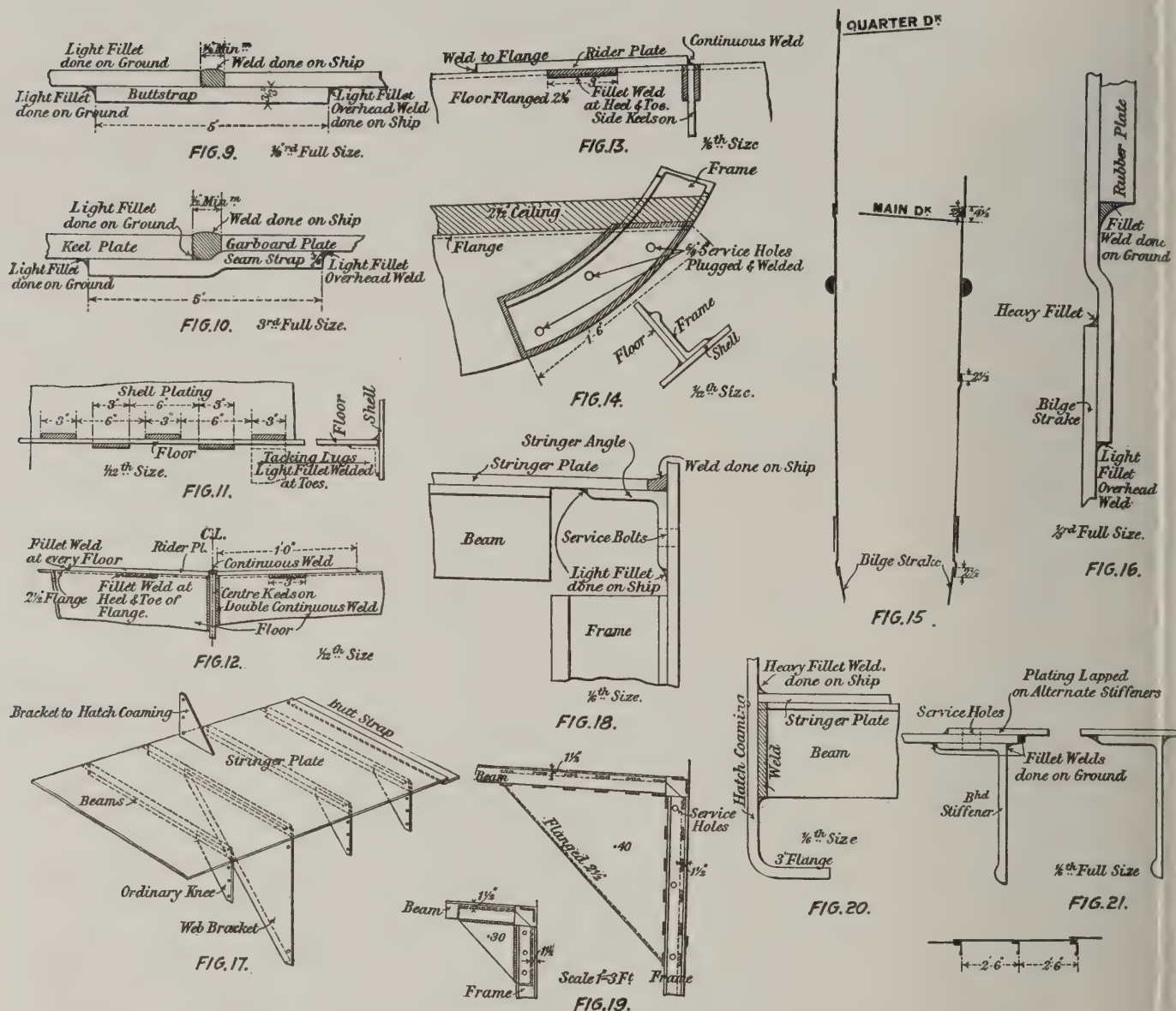
deck. The vessel is in good seaworthy condition, and I consider her much stronger than riveted barges."

THE 1,200-TON OIL BARGE HISCO

About the time of building the AC-1320, above referred to, the Tank Shipbuilding Company, Newburgh, N. Y., constructed, under the supervision of Mr. Wm. T. Bonner, the *Hisco*, a 1,200-ton oil barge designed for service in Mexico.

This barge was designed on the Isherwood principle and had a length between perpendiculars of 165 feet 3 inches, a molded breadth of 37 feet 9 inches and a depth of 8 feet 6½ inches. In order to get a direct comparison both from the standpoint of service as well as construction cost, 60 feet of the midship section was welded and the rest of the barge riveted. The shell and deck plating was ¼ inch thick, while the transverse framing members, intercostals and the like were of 5/16-inch plating. Most of the parts were made of plates eliminating many joints found necessary in riveted construction.

After completion, this barge was loaded with a 500-ton



Figs. 9 to 21.—Details of Various Types of Joints Used in Construction of Electrically-Welded Ship Fullagar

cargo, taken to New York where an additional 500 tons of pumping machinery was taken on board. She then left for the 2,500-mile voyage around the Capes to Tampico, where she arrived in due course with hull and cargo in first class condition. After 12 months of service as a bulk oil carrier on the Panuco River, with its rapid currents, heavy winds and tides, it is reported that no repairs have had to be made to this barge.

THE FULLAGAR

In February, 1920, the first all-welded, self-propelled, seagoing vessel, the *Fullagar* was put in commission. This vessel was built by the Cammel-Laird Company, Ltd., Birkenhead, England. She was designed and built as a coast ship, having a length of 150 feet, molded beam 23 feet 9 inches, molded depth 11 feet 6 inches, deadweight capacity 500 tons and cargo capacity 25,200 cubic feet. The propelling machinery is a Cammel-Laird-Fullagar oil engine of 500 brake horsepower at 110 revolutions, having four cylinders 14 inches in diameter by 20 inches stroke. The engine is located in the aft end of ship. The cargo hold is served by two hatches. The fuel oil is carried in side bunkers above the donkey boiler flat. Two masts carry the four derricks which are served by three winches.

The hull is constructed of steel, all in accordance with

Lloyd's requirements. There is used in the construction several types of welded joints. Ends of shell plates are joined together by a continuous butt weld, this welding being backed by a light strap. Plate edges are lapped and have a continuous weld on both edges, one being a heavy, and the other a light weld, and in places, edges are butted and welded as described above for ends of plating. In all cases, watertightness was obtained by a continuous weld, and non-watertight members were tack welded. Figs. 6 to 21 give details of design and construction. All welding was done with Quasi-Arc welding machines and flux covered steel wire.

The engine foundation, which was also entirely all welded has furnished an opportunity for many interesting observations. As reported by Mr. A. T. Wall, the original engine installed and later removed was very much too large for this size of ship and yet did not produce the noticeable vibrations that are generally found on similar ships, with riveted engine foundations. This example shows that better distribution of stresses to all parts of the ship can be obtained with a welded construction.

At the time of trial extremely rough weather was encountered with heavy seas producing severe shocks and strains, which she withstood satisfactorily. Quoting from

(Continued on page 440)



Typical Great Lakes Freighter, Built by Great Lakes Engineering Works: Length Overall, 617 Feet; Beam, Molded, 64 Feet; Depth, Molded, 33 Feet

The Trend in Great Lakes Ship Construction

New Types of Ships and Machinery Being Developed—Refinement in Mechanical and Structural Details Is the Tendency in New Freighters Now Under Construction and Contemplated

LARGER ships, higher powers, higher speeds, changes in engine types from steam to Diesel—along what lines is Great Lakes construction progressing? In one form or another all these changes are being tried out but just what influence any one of them will have on either immediate or future building or operating practice remains for the test of the experiments to determine.

To any one coming from the coast the introduction to steamship operation on the Lakes is a revelation to say the least. This, in spite of the fact that it is admitted as a general proposition that ships cannot be operated in any part of the Seven Seas more economically than here. But to gain from observation an insight into the organized methods which make the shipping industry as effective and productive as it is, is an inspiration to any shipping man.

The design, construction and maintenance of ships on the Lakes play a vitally important part in the operating efficiency of shipping, and it is with this phase of the subject in mind that the following notes gathered from visits to various of the shipping and shipbuilding companies are written.

NEW PASSENGER VESSELS UNDER CONSTRUCTION

Under the head of new construction the two passenger vessels now building for the Cleveland and Buffalo Line are perhaps the most outstanding feature on the Lakes at present. These ships when completed will have the distinction of being the largest ever built for inland water transportation as well as having a greater cabin and passenger-carrying capacity than any ships afloat. Originally one of these vessels was intended for turbo-electric drive and designers and

operators became very much interested in the project for its possible effect on future Lake designs. With the exception of the propelling machinery, the two ships would have been identical and, with operating conditions similar, a measure of the effectiveness of turbo-electric drive in comparison with conventional side wheel propulsion in extensive use in lower lake passenger service would have been possible.

It was only after serious consideration of the operating difficulties that the project was dropped, but with the possibility of future adoption of electric drive in new passenger designs. The additional deck space, the increased steadiness of the vessel due to side wheels, the decreased danger to propelling machinery from floating obstructions as well as the necessity for keeping the ships in constant service and the lack of dry dock capacity for these ships finally led to the adoption of side wheel propulsion for both vessels. At some later time complete details of these vessels will be published in MARINE ENGINEERING AND SHIPPING AGE.

DIESEL ELECTRIC VESSELS SOON TO BE PUT IN SERVICE

In another direction progress is being made in the development of craft intended for combined lake, canal and coastwise service as embodied in the two Diesel-electric vessels now nearing completion at the Ashtabula plant of the Great Lakes Engineering Works for the McDougal Terminal Warehouse Company of Cleveland.

These craft are 258 feet length overall, 42 feet beam, 18 feet 9 inches molded depth with decks designed for a bridge clearance of 5 feet above the main deck. They are to be powered with two 375 horsepower Lombard Diesel engines located amidships with General Electric propelling motors

delivering 500 shaft horsepower located in a motor room aft.

The advantages of this design are in the clear hold spaces and with the balance obtained by installing the heavy machinery amidships the vessels can be readily kept on an even keel. The entire operation of the boats, propelling machinery and all will be under the direct control of the captain—the engineer being required only to run the engines.

Since these vessels are to be used for lake, canal and coastwise service for the carriage of perishable cargo they are designed with two refrigerated and two non-refrigerated holds. Instead of carrying water ballast when traveling light, the tanks are arranged so they can be used to carry fuel oil which is intended for discharge at the terminal in Duluth when the vessels take on a cargo. These boats will have a service speed of about 9 miles.

LARGER AND FASTER FREIGHTERS CONTEMPLATED

A demand for larger and faster freighters is probably not far distant, for inquiries have been made by at least one of the Lakes shipping companies for ships 633 feet long, 64 feet or 66 feet beam and 33 feet molded depth. Estimates have also been worked out for installing propelling engines delivering 3,300 horsepower in one of the 630-foot type freighters instead of 2,600 horsepower.

The use of surface condensers has been contemplated as a means of eliminating boiler trouble caused by dirty harbor water when used for feed. This would avoid the present necessity of carrying large quantities of fresh water in the deep tanks for harbor service.

The possibility of adopting Diesel engines for propulsion or of equipping boilers with oil burners for Lake service seems remote, although in isolated cases they have been used.

IMPROVEMENT IN SCOTCH BOILERS

Scotch boilers being installed at the Great Lakes Engineering Works in a 12,000-ton freighter, soon to be put in service, indicate as much as any other item of equipment the tendency of the Lakes towards refinement of construction details as the most direct means for creating savings in productive service time and reliability of equipment. These boilers, which are 13 feet 6 inches in diameter by 11 feet 2 inches long with 3 Morison corrugated furnaces, are made with shells $1\frac{1}{4}$ inches thick in one strake without middle circumferential seam and having the front and back heads flanged from single $1\frac{1}{8}$ -inch plates, thus eliminating all doubling plates on these heads. With this construction, having the required factor of safety specified by the Steamboat Inspection Service, the allowable working pressure is 180 pounds.

New Ballast Pumping Systems Developed

L OADING and unloading speeds of Lake freighters and the rapid turn around in port are difficult to realize without actually observing the performance, but it has been found by certain operating companies that still greater time saving can be accomplished through improvements in ballast pumping arrangements and these are being incorporated in new vessels under construction.

On a 12,000-ton freighter recently launched, for example, the side and bottom ballast tanks are built up as a number of independent units, having connections through valves and manifolds with each other. Individual tank valves, of the 8-inch angle type, throwing one tank into direct connection with another, are controlled from the ship's deck while manifolds and valves, controlling the pumping as well as pumping equipment, are located aft in the engine room according to usual practice, with certain additional controls making it possible to pump any section of the tank system as desired.

The outstanding feature of this system is the time saving made possible by the ability to pump the side ballast tanks independently of the bottom tanks, while the bottom tanks are being filled by gravity, so that the time required for ballasting the ship is materially reduced. This time saving, however, is only one of several advantages claimed for the system.

If for any reason it is desired to use the system as a unit all tank valves can be opened and the tanks completely interconnected. From the standpoint of safety the independent tanks may be used to close off any section of the hull in case of collision or wreckage of the side or bottom of the vessel where the plating has been damaged. That this is of real value every operator probably realizes, for instances of the larger vessels in Lake service dragging in the locks or over bars are not at all infrequent. In such cases the closed tanks act as watertight compartments. Accurate control of ballast, tending to promote stability and fuel economy, is also credited to the system.

The machinery complications incident to a ballast system of this kind have been carefully considered and, although the additional weight of valves and piping together with the maintenance of the system have a bearing on the economic value of it, the greatest speed and safety apparently far overbalance these factors.

New Bearing Metal Introduced to Marine Service

B EARING troubles are by no means uncommon in marine service and any steps that can be taken to prevent burned out bearings or scored shafts or pins, causing expensive delays, deserve a careful investigation. One of the prominent shipbuilding concerns on the Lakes having in charge the construction of a great many of the largest freighters seems to have overcome bearing difficulties on its ships through the use of a new bearing metal adapted from stationary practice. This metal seems to be more or less proof against the usual difficulties experienced in bearings which result especially from over heating, lack of lubrication and other abnormal conditions.

PROPERTIES OF NEW BEARING METAL

This metal is a pure alloy consisting of copper and lead and is poured into the bearings in a molten state in much the same manner as babbitt. It is said to have a tensile strength of 11,000 pounds per square inch and three times the compressive stress of babbitt, while it has approximately the same combination of friction and bearing qualities as the latter metal. It is, however, slightly harder to work. So far it has been used in the connecting rod bearings and for similar service in various parts of the machinery.

The first trial given this metal aboardship was in the connecting rod bearings. One crank pin bearing was slack and pounded hard all the way on a trip from Detroit to Duluth. On inspection, after the trip, the bearing was apparently no worse for the pounding and ran through the season.

On the first trip this spring one of the oil lines on this engine broke while the ship was far out in the Lake, so that the crank pin was getting no lubricant at all. The bearings became too hot to cool with water. In spite of this, the engine was driven for fifteen hours without crank pin lubrication until she reached port, where the bearing was overhauled. With the exception of a certain amount of lead which the heat had brought to the surface, and which was scraped off, the bearings were apparently all right. The pin was smoothed up with an oil stone. Since this slight overhauling the engine has been in service without further trouble.

Increase in Oil Freight Rates Causes Foreign Shipyards to Receive Numerous Inquiries for Tankers

General Adoption of Diesels for Motive Power Predicted

Foreign Taxation of Shipping, Delays in Home Ports and Bill to Regulate Storage of Petroleum Troubling English Shipowners

By W. H. Wendon*

THE phenomenal advance in oil freights—the rates at the latest writing are three-fold those ruling at the beginning of the year—is a natural result of the extraordinary demand for oil tank steamers, and it is not surprising, therefore, that tenders are becoming more and more frequent in connection with vessels of this type. The construction of an oil tanker of 12,000 tons, to be fitted with Diesel engines, is contemplated, inquiries are circulating to build a 10,000-ton oil tanker with steam engines, while another inquiry relates to a 10,000-ton oil tanker to carry molasses and fitted with Diesels.

On the continent, the French Government is understood to be seeking tenders from French shipbuilders for the construction of an oil tanker of about 9,000 tons, and the Rotterdam Dry Dock Company has received a contract to build a tanker of 6,000 tons.

The whole question of the motor-vessel is thus once more on the forefront. The perseverance of the pioneers who bore the brunt of the experimental contracts would seem to have been justified, for it is generally accepted that the internal combustion engine is now a commercial proposition. One well-known and successful United Kingdom shipowner, who has for some time been regarding, from all angles, the question of adopting Diesels, is now convinced that the Diesel engine is the motive power of the future, and in support of his assertion, he has asked for tenders for the construction of a vessel to carry between 7,500 and 8,000 tons. This shipowner furthermore considers that the general adoption of the internal combustion engine will be much quicker than was the transit from sail to steam, or from the compound engine to the triple expansion engine.

FRENCH SHIPOWNERS INTERESTED

A further illustration of the increased attention which the internal combustion engine is receiving at the hands of shipowners generally is afforded in the case of France, where hitherto the engine has been practically ignored. Only one Diesel engine vessel—a boat of 10,000 tons deadweight—has, in fact, been ordered in France since the end of the war. It is nearing completion at Nantes, but, no doubt as a result of the pioneer operations of shipowners of other countries with this type of vessel, the passing interest is developing into something more tangible. One leading French shipping company, the Messageries Maritimes, is understood to be contemplating the placing of an order for the construction of a 10,500-ton motor-liner, to be built for passenger service between Marseilles and the Eastern Mediterranean. In view of the increased interest in the type, it is not too much to expect that other French shipowners will at least make inquiries as to the possibilities of the internal combustion engine as an economical motive power for passenger and cargo ships.

The imposition of taxation on shipping at home and abroad is again a leading question in United Kingdom ship-

*Our British Correspondent.

ping circles. The subject has from time to time been debated at great length for many months past, but, at this writing, a solution of the problem seems as far off as ever. The offer of the United States Government to exempt from taxation the ships of any nation which similarly exempts United States shipping from taxation in her ports has long been acknowledged by shipping experts on this side of the Atlantic as a highly valuable one, and, in view of the national financial proposals now being dealt with in Parliament, the shipping "powers-that-be" deem it an opportune moment to repeat emphatically that the offer of the United States Government should be accepted.

Sir Frederick Lewis reminds us, that during the past few years it has become a more and more common practice for foreign Governments to tax the earnings of ships touching at their ports. Moreover, in each country an entirely different method of procedure is adopted for calculating such taxation. Sir Frederick, who is a confirmed supporter of the United States proposal in this important matter, points out that owing to the extraordinarily peculiar practice of some countries in looking upon freights as profits, and taxing those freights as though they were profits, it very often results that shipowners pay income tax upon a voyage which may, in fact, have resulted in a loss.

ENGLAND GREATEST LOSER

Then again, it has to be borne in mind that, owing to the fact that Great Britain has far more tonnage engaged in the overseas trade than any other nation, any general extension of the practice, if carried to its logical conclusion, would obviously result in a greater amount being paid out in taxation to foreign countries than Great Britain would receive from taxation imposed upon foreign shipping. Sir Frederick Lewis believes that, from the nation's point of view, it would be an advantage that the offer of the United States Government be accepted.

British shipowners would also welcome a step which would both relieve them of the irksome duty of filling up complicated and voluminous returns to the United States tax authorities, and at the same time relieve them from the liability for taxation in this particular direction. In a word, British shipowners would welcome it if only as a first step towards the larger policy of complete immunity of shipping from international taxation. What view the British Government will take remains, of course, to be seen.

DELAYS IN PORT

Shipowners in the British Isles are experiencing an anxious time in regard to a matter over which, unfortunately for them, they have very little control, and that is in respect of delays to vessels while in port. Concrete instances, involving serious financial losses, may be cited as illustrations of the delays which shipowners are incurring in British ports as compared with ports abroad.

Thus, a vessel under the management of a leading firm of

shipowners loaded a coal cargo in the United States. She arrived in port at 8 o'clock on a Sunday morning and left again at 6 o'clock on the following Tuesday morning, having loaded 8,800 tons of cargo and bunker coal. This particular instance, moreover, occurred during a holiday week-end. During the same week a steamer of about like capacity loaded a cargo of coal at Cardiff. The vessel, after having waited nine days to get into berth, occupied eight days in loading and bunkering, and did not sail until the ninth day.

Such delays, unfortunately, are not confined to Cardiff, or even to South Wales as a whole; they are authoritatively stated to be typical of a great many other British ports when they are compared with foreign ports which have specialized in the handling of a particular description of cargo. Mr. J. Denholm, a leading Scottish shipowner, is my authority for stating that while, in pre-war days, a boat of 7,000 or 8,000 tons could be loaded in eight to ten days, now a vessel is seldom loaded within three weeks, adding materially, of course, to the cost of working.

TO REGULATE STORAGE OF PETROLEUM

The Shipowners' Parliamentary Committee, a body whose members are prominently identified with the Chamber of Shipping of the United Kingdom, have taken up a matter which is of great urgency from the point of view of British shipowners. The trouble revolves round a Bill to amend the Petroleum Acts, and under which a license will have to be obtained from a Secretary of State before petroleum spirit exceeding 1,000 tons or petroleum 5,000 tons can be stored.

The measure has been instituted, presumably to ensure that, in the event of another war, the contents of the storage accommodation will be, as far as is humanly possible, immune from attack. The whole point is that naval and military exigencies are apparently to be placed before those of commerce. At present the dock and harbor authorities grant applications for the erection of storage tanks, and it has been possible in the past for work to be commenced on the installation within a few days of the request being made. But, with the decision of a Government Department to be awaited, serious delay will be occasioned, added to which the storage tanks may have to be erected in positions where the danger of attack by aeroplane or otherwise may be minimized, with the result that the cost of installation and pipage might be gravely prejudicial to the trading interests of those concerned.

It is realized, of course, that there should be national reserves of petroleum in protected positions, but it is maintained that such needs should be arranged for by the Government irrespective of commercial requirements. The Shipowners' Parliamentary Committee have therefore decided to oppose the Bill, they being of opinion that it introduces the unsound and disastrous principle that commercial requirements should be subordinated to the naval and military exigencies, and they view with apprehension the attempt to legislate for commerce on the basis of a state of war.

They hold that the removal of commercial stores of petroleum in accordance with defence needs will cause the gravest expense and inconvenience to shipping, and will throw a heavy burden on the consumers of such stores by increasing the cost needed to cover the economic waste which will be caused, in addition to the extra capital charges which must necessarily be incurred by private enterprise in order to provide installations of a capacity capable of satisfying the requirements of defence. In brief, the contention of the Shipowners' Parliamentary Committee is that the necessary reserves should be created by, and maintained under, the control of the Defence Ministries and at the national cost, and that such national stores should be entirely separate from the commercial, thus avoiding the dislocation of private interests.

TRAINING CADETS

The question of apprentices for the sea has been taken up with vigor by Sir William Reardon-Smith (head of the Reardon-Smith Lines), who commenced his sea career at the age of twelve and spent some 33 years at sea, both in sailing-vessels and later in steamers, for twenty years of which period he was in command. I gather that he decided, when starting in business as a shipowner, to carry apprentices in all the steamers owned or managed by him, and to ensure that they obtained a practical knowledge of navigation, combined with a thorough training for sea life during their term of apprenticeship.

The number of apprentices carried in Sir William Reardon-Smith's steamers ranges from four in the smaller vessels to eight in the larger ones—a total of about 200 apprentices for the fleet. The apprentices' accommodation is in the midship house, near the captain's and officers' quarters. The indentures signed are for a period of four years, and wages paid to the apprentices are £8 for the first year, £9 for the second, £11 for the third and £12 for the fourth year, making a total of £40 for the period of apprenticeship. The more promising boys, as they approach the end of their apprenticeship, act as third mates, and on satisfactory completion of their indentures they receive a cash bonus to help defray the expenses of studying for examination as second mate.

Some time ago Sir W. R. Smith's firm subscribed £2,000 as the nucleus of a fund for a nautical school at Cardiff for the training of young boys for the sea, and the fund was subsequently augmented to £20,000. Boys are admitted at the age of thirteen, and the duration of the school course is three years. The first two years are of a preparatory character, and the final year (the cadet course) is devoted to training on lines approved by the Board of Trade. The subjects taught during the two years' preparatory course are English, mathematics, science, geography, with its practical application, physical exercises and manual work, signaling, etc. During the third and last year the instruction is mainly confined to such subjects as have a distinct bearing on the future career of the boys. The cadet course (third year) is recognized for six months' remission of sea service. My object in referring to the foregoing at some length is to afford United States shipowners an idea of the methods adopted on this side of the Atlantic to ensure, for the coming years, an adequate supply of young but efficient officers and men.

MAY REQUIRE DOCUMENTS IN TURKISH

A mild sensation has been created in shipping circles here by the intimation that the Turkish authorities are now insisting that all bills of lading, passenger tickets and masters' receipts for vessels loading in Turkish ports shall be worded exclusively in Turkish. The regulation is applied equally whether a vessel is loading for a foreign or a Turkish destination, and whether a passenger has booked to a Turkish destination or otherwise. Orders will also be issued to the master of a vessel in Turkish, and therefore, probably, in a language he does not understand. A vigorous protest against the action of the Turkish authorities in prohibiting documents in any other language than their own will doubtless be registered, for it is easy to imagine what chaos would ensue if every country adopted a similar attitude. Every vessel would have to carry an official interpreter.

MARINE WORK of all classes, reaching a total of \$220,013,463, has been reported by MARINE ENGINEERING AND SHIPPING AGE as contemplated and contracted for during the first half of 1923. Vessel construction and repair work contemplated and awarded during the second quarter reached a total of \$38,459,801; port improvement work, contemplated and awarded, \$91,347,628; making a total of \$129,807,429 as against \$90,206,034 for the first quarter.



Motorship Dalgoma

The Largest Two Cycle Engined Motorship

Sulzer Two Cycle Diesel Engines of 3,200 Brake Horsepower Built in Scotland for Motorship Dalgoma

By Our Special London Correspondent

IN Europe, the completion of cargo and even passenger ships equipped with four cycle Diesel engines is becoming so common that very little notice is taken of every new vessel of this class that is placed in commission. The number of two cycle engined craft is still, however, very small, so that special attention is paid by engineers, ship-owners and shipbuilders to boats in which propelling machinery operating on this principle is fitted.

Probably one of the most interesting ships of the class is the *Dalgoma* which sailed on her maiden voyage to the East early in June. She was built to the order of the British India Steam Navigation Company, which possesses more steamers than any other British firm, and is one of a series of motor craft constructed for this concern, the majority of which however are equipped with four cycle engines.

ENGINES BUILT IN SCOTLAND

In the *Dalgoma* are installed the biggest motors of the Sulzer two cycle type that have yet been fitted on a ship, and in view of the fact that half a dozen of the leading British marine engine builders have taken up a license for the manufacture of the Sulzer Diesel engine, it is specially noteworthy that the machinery of this ship was built by a Scottish firm, Messrs. Alexander Stephen and Sons. The only other Sulzer engined ship constructed in Great Britain was provided with machinery by the Swiss manufacturers so that the *Dalgoma* represents something of a new departure in British shipbuilding.

She is 448 feet in length overall with a length between perpendiculars of 430 feet, the beam being 54 feet 6 inches,

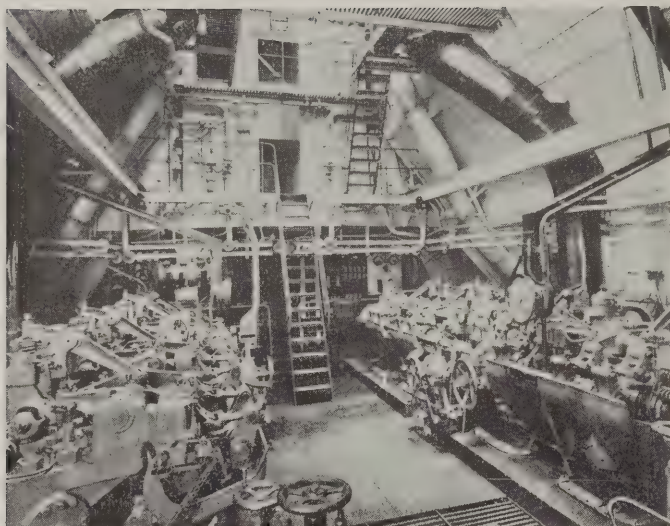
the depth 32 feet 6 inches, and the deadweight, including fuel, about 9,300 tons.

The two engines are each designed to run in the ship at 85 revolutions per minute at which speed the total power developed is 3,200 brake horsepower or about 4,300 indicated horsepower (2,150 indicated horsepower for each engine). It may be added, however, that exactly similar engines have been built for installation in another ship, but the speed has been increased to 100 revolutions per minute giving an output of 2,000 brake horsepower. Bearing this in mind, the fact that the total length of the engine room is only 48 feet is worthy of consideration in any comparisons that are made between two and four cycle plants. It is true that an additional space is required in the form of a recess at the after end of the engine room for the turbo blowers, but this is comparatively small.

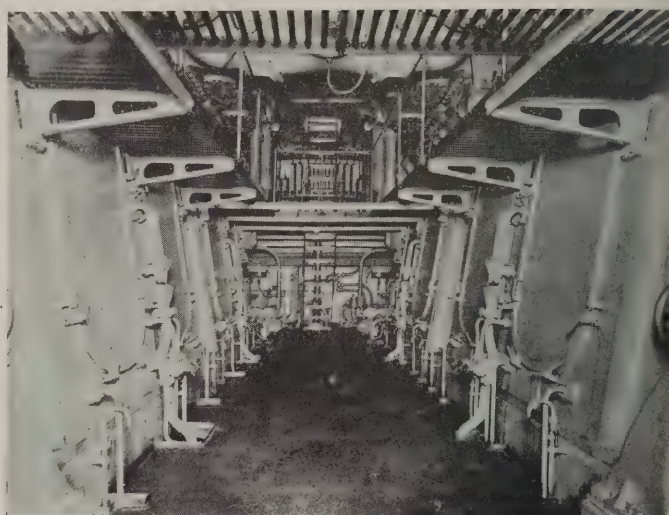
This engine has four cylinders, whereas a corresponding four cycle motor would necessarily have six. The cylinders are 680 millimeters bore with a stroke of 1,100 millimeters and it may be remarked that with the engines running at normal speed the mean indicated pressure in the cylinders varies between 90 and 100 pounds per square inch. The mean effective pressure referred to brake horsepower would therefore be in the neighborhood of 73 pounds per square inch which is not excessive.

CONTROL STATION AT TOP OF CYLINDERS

An unusual feature of the installation lies in the location of the control station at the level of the top of the cylinders. The reason for the employment of this system is that the whole of the control gear, valve mechanism, fuel



Control Station at Tops of Cylinders



The Engine Room at Floor Level

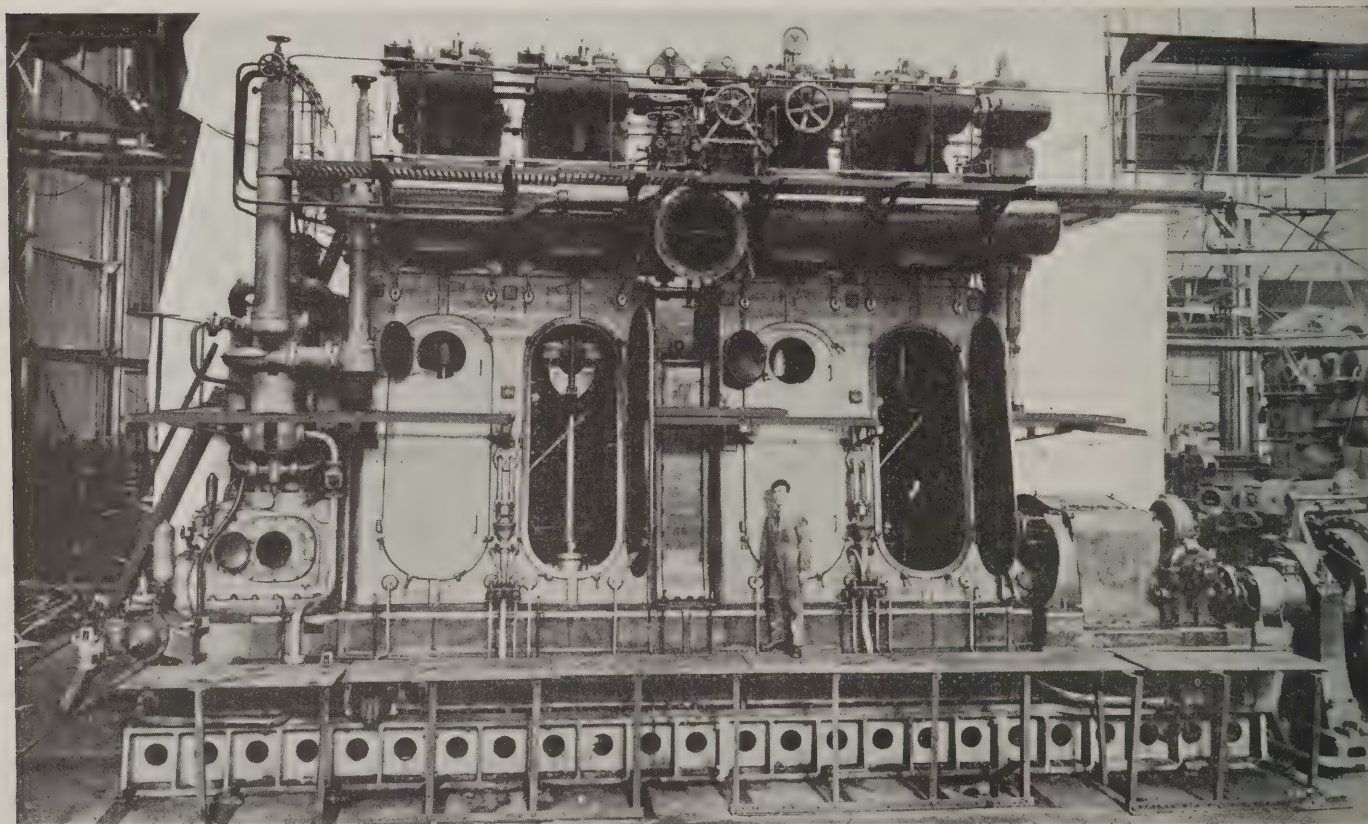
pumps and, in fact, the most important parts of the machinery are at the top of the engine and not at the bottom. On the other hand there is a large amount of auxiliary machinery on the engine room floor, so that it is questionable whether there is much to be gained either way.

In general design, the engines are of the well-known Sulzer type and as they have been so frequently described it is scarcely necessary to give further detailed particulars. In one point, however, they are unusual in the adoption of turbo scavenging pumps, instead of having the normal piston pumps driven by a crank on the main engine crankshaft. This is only the second ship in which such an arrangement has been fitted and is the first British vessel where it is employed.

As previously mentioned, there are two turbo blowers arranged in a recess at the after end of the engine room. Both

of these blowers deliver into one large pipe, from which branches are taken to each of the propelling engines. The turbo blowers are driven by electric motors of about 230 brake horsepower running at the high speed of 2,750 revolutions per minute. Air is drawn down from the deck to the blowers and is discharged to the main trunk at a pressure of about 2 pounds per square inch above atmospheric pressure.

The output of these blowers is high, being about 17,000 cubic feet per minute at a pressure of 1.8 pounds per square inch. It was found on actual trials that the power needed from the electric motor was in the neighborhood of 175 brake horsepower, one set, of course, supplying all the air necessary for the scavenging of both main engines. This power is equivalent to about 5 percent of the total engine output and for given cylinder dimensions it will be seen that this amount is virtually added to the shaft



1,600 Brake Horsepower Stephen-Sulzer Engine

horsepower developed, by detaching the scavenging pumps from the propelling motors.

The arrangement of auxiliary machinery differs to a considerable extent from that usually adopted in four cycle engined vessels. There are only two electric generators, in spite of the fact that all auxiliaries are electrically operated. These necessarily have to be of large size and they comprise 410 brake horsepower four cylinder two cycle Sulzer engines each driving a dynamo of 260 kilowatts at 220 volts.

In view of an increasing tendency on the part of some builders to utilize high speed Diesel machinery for auxiliary purposes, it may be stated that these engines run at only 200 revolutions per minute. There has lately been some trouble experienced with auxiliary machinery mainly on account of the high speed and it is by no means unlikely that there will be a gradual reversion to the relatively low speed auxiliary in the future in spite of its higher cost and the additional weight and space occupied.

It is somewhat surprising to find two electrically driven auxiliary compressors installed in the engine room. As is well known, in most ships, one auxiliary is ample for all purposes. The installation of an additional set purely for

safety in the case of a very remote emergency hardly seems to be warranted under present day conditions. Each of these compressors is driven by a 150 brake horsepower electric motor. They are, of course, not required in normal circumstances and even when entering and leaving port only one is needed for at most an hour or two.

The propelling engines drive their own three-stage air compressors and, in addition, a main lubricating pump, a bilge pump and a small vertical high pressure pump for supplying lubricating oil at about 250 pounds per square inch to the crosshead pins. The jacket and piston cooling pumps are electrically driven, only one of the latter being provided but there are two piston cooling pumps, delivering water to the pistons at about 25 pounds per square inch. These pumps are of the centrifugal type and in order to ensure that they shall always run drowned, they are supplied with fresh water from a large tank located high up in the engine room. The piston cooling water, after being forced through the pistons by the centrifugal pump, drops into a tank below the engine room floor, when it is picked up by a separate plunger pump and thus raised to the gravity feed tank which also acts as a cooling pump. Sea water cools the jackets.

Scout Cruiser Detroit Completes Official Trials

**Vessel Built by Bethlehem Shipbuilding Corporation, Ltd.,
Equipped with Turbines Developing 100,000 Shaft Horsepower**

THE United States scout cruiser *Detroit*, which has just completed exhaustive trials off the coast of Maine, has established a record by developing the highest power ever attained by any vessel constructed in the United States. The *Detroit* was built for the United States Navy by the

Bethlehem Shipbuilding Corporation, Ltd., at its Fore River Plant, Quincy, Mass.

The vessel is in effect a very fast and powerful destroyer, having a length of 555 feet, a breadth of 55 feet and a normal load displacement of 7,200 tons. She carries twelve 6-inch



United States Scout Cruiser Detroit Undergoing Official Trials

rapid fire guns of the very latest model, four 3-inch anti-aircraft guns capable of firing into the air at any angle up to 90 degrees, ten torpedo tubes fitted to fire the latest model 21-inch long range torpedoes, and more than two hundred mines which can be launched over her stern and laid in a very few minutes while running at full speed.

The vessel is fitted to carry airplanes which can be launched from revolving catapults while running with, against or across the wind; also with high power radio apparatus, wireless telephones, submarine signalling apparatus, electric steering gear, laundry, workshop, hospital, etc.; in fact, she is in all respects the last word in design, construction, equipment and armament that lessons of the late world war have shown to be essential for carrying out duty to which she would be assigned in time of war.

Power for lighting the vessel and for operating the searchlights, wireless and various other electric-driven auxiliaries is generated by four 100-kilowatt turbo-generator sets.

PROPELLING MACHINERY DEVELOPS 100,000 HORSEPOWER

The propelling machinery of the *Detroit*, designed and constructed throughout by the Bethlehem Shipbuilding Corporation, Ltd., developed 100,000 shaft horsepower on trials, which is sufficient to drive the vessel through the seas at a speed of 35 knots, or nearly 41 land miles per hour. This speed would take the vessel from New York to Liverpool in 80 hours as compared with about 120 hours required for the fastest passenger liner now afloat.

Describing briefly the main propelling machinery, the ves-

sel is fitted with twelve oil-fired watertube express type boilers, three being located in each of the four watertight compartments, and operated under forced draft. There are two watertight engine room compartments amidships in which are located the twelve powerful Curtis-type marine steam turbines. These turbines operate at a speed of 2,500 revolutions per minute which is reduced, through reduction gears on each of the four propeller shafts, to 400 revolutions per minute. The excellent economy obtained in connection with the oil fuel consumption as compared with that of the older coal burning installation, is quite remarkable.

Some idea of the enormous power and capacity of the propulsion machinery installed on the *Detroit* may be obtained from the following figures:

At full speed, the shaft horsepower developed is approximately three times as much as fitted to the recent battleships. Oil fuel is consumed at full speed at the rate of 100,000 pounds per hour, which requires 624,000 cubic feet of air per minute to effect combustion.

The twelve express type boilers contain 65 miles of steel tubes, in which steam is generated at the rate of 1,500,000 pounds per hour at a pressure of 265 pounds per square inch.

The main turbines are fitted with approximately 32,000 blades, some of which rotate at a speed of eight miles per minute.

Four main condensers, located in the engine rooms, require about 70,000,000 pounds of sea water per hour to condense the 1,200,000 pounds of steam from the main turbines.

Milwaukee Makes 36 Knots

THE *Milwaukee*, second of the new type scout cruisers built by the Todd Shipyards Corporation, developed a speed of 36 knots, equal to 41.4 statute miles, her engines developing 97,000 shaft horsepower on her recent trials. She is the fastest vessel of her type in the world.

Admiral J. K. Robison, chief of the Bureau of Steam Engineering, pronounced the trial as highly successful and Captain W. C. Asserson, U. S. N., commander of the *Milwaukee*, said he was delighted with the performance of his new command.

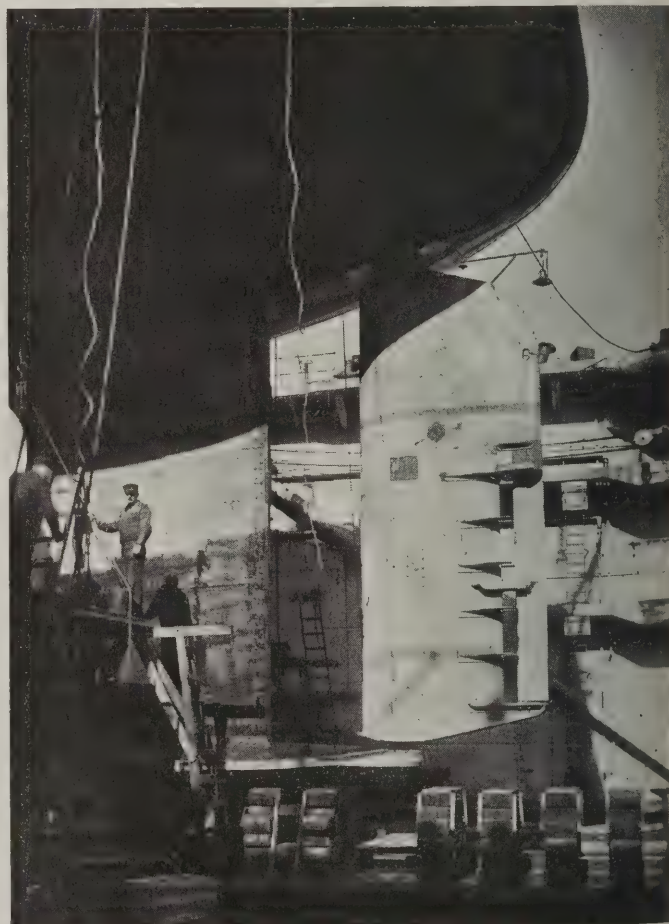
At 8.45 a. m., the *Milwaukee* left her pier in the Todd yards at Tacoma, Wash., and swung into the stream at quarter speed. After rounding Brown's Point, speed was increased until the cruiser logged 21.2 knots, the average maintained until she reached Port Townsend. Off Marrowstone Light, where the presence of the Pacific is first manifest, the beginning of her real speed trials commenced.

Slowly at first, the long, narrow cruiser nosed her way out into the straits, cutting through the water at a constantly increasing speed until she was reeling off 35.2 knots. The wind velocity at this speed was so great that some of the official observers were almost blown bodily against rails and bulkheads.

After nearly an hour's run, during which the same high speed was maintained while the *Milwaukee* raced down the straits, all but one of the remaining steam nozzles were turned on, and before Port Angeles was astern, the cruiser was tearing through the water at the record-breaking speed, for a vessel of her type, of a trifle faster than 36 knots. The cruiser's bow was kept headed toward the mouth of the straits until Race Rocks were astern and then put about and headed for home.

The *Omaha*, first of the Todd-built scout cruisers, recently clipped 20 hours and 56 minutes off the record for the run between Honolulu and San Francisco. She steamed the distance of 2,103 miles in 75 hours and 11 minutes, the previous record, held by the steamship *H. F. Alexander*, was 100 hours and 31 minutes.

Flettner Deflecting Rudder



Flettner Deflecting Rudder on Hamburg American Line Motorship Odenwald. This Rudder Was Described in Our April Issue

Care and Upkeep of Marine Watertube Boilers

Maximum Efficiency Can Only Be Obtained by Keeping the Power Plant in First Class Physical Condition

By A. Ross Mackay*

IN the era of prosperity immediately following the war it was sufficient that a vessel be operated without excessive cost in overhauling or repairs, but in these days, when freight rates have dropped to a point at which operating costs are barely covered, rigid economy must be practiced, if the vessel is to continue in service. As the boilers are the heart of the ship, it is most important that they be operated to give the greatest efficiency, which can only be accomplished by keeping them in first class physical condition.

The handling of the fires or oil burners to give the lowest temperature of funnel gases and the least amount of excess air commensurate with complete combustion; heating surfaces kept free from heavy soot deposits by the periodical use of the steam lance or blowers; the prevention of corrosion, pitting, scale formation and tube loss by careful observation of the feed and boiler water, are all recognized as good practice aboardship, whether the boilers be of Scotch or watertube type. To a certain extent, also, the practices that govern the inspection, overhaul and repair of Scotch boilers are applicable to the watertube boiler. Any engineer who has operated an installation of Scotch boilers efficiently and economically should be all the better able to operate a watertube installation, when he has mastered the details of construction of the boilers and the best methods to be followed in keeping them in condition for such operation.

EXTERNAL INSPECTION

In inspecting and overhauling watertube boilers the engineer will, of course, be governed by the length of the stay in port and the time that can be accordingly given to this most important duty. If the stay in port is to be brief, requiring that the boilers shall be held all ready for getting the fires under way, a close inspection can be made of the boilers externally. The condition of the tile and insulating material between the side generating tubes and casing plates can be tested for tightness by light blows of the knuckles on the plates, a hollow sound indicating, of course, an air space which will require filling at the first available opportunity. In similar manner the insulation of the furnace walls can be tested and inspection made of the bolts securing the walls. All tube doors, inspection doors and cleaning doors can be gone over, to see that they fit against their frames and that the latches are so adjusted that they hold the doors tightly closed, preventing any air leakage from this source. The straps covering the joints in the casing plates should also be examined for the same reason. For that matter, the casings at these points can be tested with a torch or lighted candle when the boiler is in use, air leaks being temporarily calked with asbestos putty or other suitable material.

In the event that the boilers cannot be emptied, and that, accordingly, the internal condition of the tubes, headers and drums cannot be noted, a very thorough inspection can be made of the fire side of the heating surfaces, the furnaces and baffles, in addition to the casing inspection aforementioned. In this condition, also, the boiler can be inspected for any leakage at the tube or nipple seats.

CONSULT DRAWINGS BEFORE MAKING CHANGES

Too much care cannot be exercised in the inspection and overhaul of the furnace, not only for the reason that a defective wall will affect the combustion, and consequently the boiler efficiency, but that the boiler structure and casings may be seriously damaged, if exposed to the intense heat of the furnace. As the boiler manufacturer usually furnishes each vessel with a very complete set of drawings, it would be well to make a thorough study of the furnace design, noting the provision made for the expansion of the brickwork, the method of securing the brick in place and the different materials used to insulate the walls and floor. Most of us are prone to experiment—especially when some one else bears the expense—and the marine engineer is no exception. It should be borne in mind, however, that the design of the furnace, and the use of certain materials in the design, are the outcome of many years of close application to the science of burning coal and oil efficiently, and that therefore no change in design or material should be made without careful consideration of the possible consequences.

If any departure from the given design is contemplated, or if there is any doubt in the mind of the operator as to the condition of the furnaces, the matter should be taken up with the manufacturers, who will undoubtedly give him the benefit of their knowledge and experience. In this connection it might be stated that at least one watertube boiler company maintains a trained corps of visiting engineers who board the vessels equipped with their boilers, make inspection of the boilers and discuss with the operating personnel their care and upkeep, this service being free of charge. Needless to say, such service is not altogether in the interest of the operator, as the manufacturers are thus assured that their product is not only giving perfect satisfaction, but that it is receiving the care and attention that should be accorded any valuable piece of equipment.

BAFFLES

A careful inspection should be made of all baffles, to see that they are in correct position and securely fastened. If the boilers are of Babcock and Wilcox type, particular attention should be given the baffle forming the furnace roof. This baffle is of molded tile fitted to rest on the row of tubes directly over the furnace. It extends from the front headers to the rear vertical baffle and directs the furnace gases to the first pass, between the vertical baffle and the rear headers. Any leakage in this horizontal baffle will allow the gases to short circuit into the last pass, thence to the boiler uptake. As the condition of this baffle can be observed from the furnace and the cleaning doors at the boiler sides, and, in the case of the latter, when the boiler is under steam, there is no excuse for its being operated in defective condition, once the defect has been noted.

As the tubes over the furnace are really part of the furnace, it follows that they should be inspected in conjunction with the furnace. These tubes are subjected to the greatest temperatures, and are also subject to destruction from floating matter lodging within their interior. They should be carefully examined for distortion and "blisters," especially the latter. These blisters are generally caused by the lodging of loose scale in the tube and the building up, over the scale, of matter usually held in suspension, until a point is reached at which the tube becomes overheated directly under the scale and, due to the pressure within, bulges outward towards the furnaces.

*Engineer, Babcock & Wilcox Company, New York.

BLISTERS

It often happens that on internal inspection the blistered tube shows no sign of scale or other deposit at the point of failure, so the blister is attributed to some other cause. In reasoning thus, however, the point is entirely overlooked that the movement of the wall of the tube disturbs the deposit, which is swept from the tube by the violent action of the water and steam within the tube, leaving no indication of its late presence. In somewhat the same manner tubes that have blistered from oil deposit very often show no sign of oil locally.

The question naturally arises: When is a blistered tube due for renewal? On this point authorities and services differ, so the operator will have to be guided largely by his own or others' experience in this connection. In certain services the slightest blister or bulge is sufficient to condemn a tube, while in others the operator uses his own good judgment as to whether or not the wall of the tube has been sufficiently injured to warrant renewal. There are many factors to be considered, such as the number of tubes blistered and the amount of new tubes available, the fact that the boiler will have to be emptied to permit of the renewal, the length of the stay in port or the voyage ahead. In case of any doubt, however, the tubes should be renewed; otherwise it may be necessary to renew the tube at sea and under extreme difficulty.

INSPECTION OF TUBES

In inspecting the headers and tubes internally it is advisable to remove the entire lower row of handhole caps in the front and rear headers, so that a thorough examination can be made of the entire row, the mud drum and mud drum nipples. The condition of these tubes will determine whether or not the caps to the entire row directly over it should also be removed, and even the row next above that, all according to just what must be done in the way of cleaning the inner surfaces. For inspection only, it is sufficient to remove a handhole cap here and there in each horizontal row, thus avoiding the needless waste of gaskets.

Tubes can generally be cleaned by the use of the brushes or expanding spoon-type scrapers furnished by the manufacturers, but if hard scale has formed, usually in the lower rows only, turbinizing will be necessary. During this operation the turbine cleaner should not be allowed to remain for any length of time at one spot in the tube, otherwise the surface of the tube may be damaged, rendering it more liable to corrosion. Care must also be taken that the tubes, headers and mud drum are thoroughly cleaned out after turbinizing, to avoid the danger from floating scale described above.

A THOROUGH CLEANING METHOD

Should the boiler be badly scaled and time permit, a thorough cleaning out may be given by the following method:

Drain the boiler, close it up, with the exception of a lower handhole, through which pour about 30 gallons of kerosene into the mud drum. Put the handhole cap in place and open the air cock on the steam drum. Through a $\frac{3}{4}$ -inch pipe, tapped into a special handhole cap in the end of the mud drum, allow a steam jet to blow into the boiler until such time as the condensate has risen well over boiler working level, or about three-quarter glass, which should take from 36 to 48 hours, when the steam can be shut off, the pressure relieved and the boiler drained. Just as soon as possible the handhole plates should be removed and the tubes thoroughly scraped and washed out. It will be found that the scale will come away clean from the metal surfaces. Vaporizing the boiler by this method has been found very effective, not only in loosening scale but in giving the boiler a thorough cleaning out.

The inspection of the internal fittings of the steam drum scarcely needs mention, beyond perhaps a word of caution

with regard to the zinc plates. These plates are usually suspended in baskets of perforated sheet metal, thus making provision for the reception of the disintegrated zincs. Should these baskets get adrift from their fastenings, or should they be incorrectly replaced after work has been performed in the drum, portions of disintegrated zinc are apt to pass through the downtake nipples into the sections, causing tube losses.

PITTING

The steam drum should be wire brushed and wiped out with kerosene to enable a proper inspection to be made for any sign of pitting or other action. In the event that pitting is discovered, which generally occurs at the working water level where the nipples and tubes enter the drum, the pitted portions should be cleaned down to bare metal and the entire internal surface of the drum given a coat of French zinc. Pitted tubes can also be treated with a thin coat of French zinc and kerosene. A deep pit in the drum shell should be filled with cement or one of the special preparations devised for just such purposes. While such measures help prevent further action within the drum the real remedy lies in preventing the entrance of entrained air with the feed water. There is no sense in endeavoring to prevent pitting by the method described, which is only palliative, at best, if no steps are taken to locate and remedy the cause of the trouble.

In outlining some of the economies which may be practiced in the care and upkeep of marine watertube boilers, we have purposely passed over details of overhaul and repair common to most boilers. No one appreciates more than the marine engineer the importance of having the power plant in first class condition, and his splendid record of achievement in break-down repairs at sea has been made principally by the happening of the unexpected and not from neglect or oversight on his part.

An Analysis of Claims of the Electric Drive Over the Geared Drive

(Continued from page 419)

As to the backing power, this feature has no practical value, as it bears only on the maximum speed of the vessel that can be eventually attained in the astern direction and not on the actual ability to stop and maneuver. Furthermore, too much power applied to a propeller, with the blades working on their backs, produces cavitation and nullifies the purpose intended.

In reply to the last point, it can be said that in all modern geared turbine installations there are generally fitted special impulse turbines of rugged design, and the argument against derangement of same is entirely fallacious, there being no record of a single case where trouble has been experienced of this nature when so fitted.

ELECTRIC DRIVE MORE EXPENSIVE AND HEAVIER

The electric drive is both more expensive and heavier, which varies with the class of vessel.

For a vessel of the scout cruiser type the weight is about 300 tons more, with the cost about 25 percent greater.

CONCLUSION

From the foregoing it is evident that the electric drive is far from fulfilling the promises of its advocates, and it is this which possibly explains their reluctance to publish anything other than theoretical figures pertaining to same.

Some comparisons have been made by the electrical advocates using the old direct drive steam installations for this purpose, but which have no particular bearing on the subject, on account of this earlier drive having for some time not been considered for new construction.

Influence of Speed on Economy of Motorships

Faster Ship is at a Disadvantage Because of Initial Cost of Larger Power Plant and Increased Consumption of Fuel

By L. B. Chapman*

IN fixing the characteristics of a new design, comparative studies are often made to determine the influence of the following factors on the operating expenses:

- 1. Type of machinery.
- 2. Size of ship.
- 3. Speed of ship.
- 4. Speed of handling cargo.
- 5. Length of voyage.
- 6. Percentage of full load capacity carried per trip.

A number of these items have been taken up by the writer in previous articles in MARINE ENGINEERING AND SHIPPING AGE. In this article it is proposed to investigate in a systematic manner the effect of various speeds on the operating expenses of a cargo ship of given dimensions.

The ship selected for this comparison has the following characteristics:

Length between perpendiculars	420 feet
Beam	57 feet
Molded depth	35 feet
Loaded draft	27 feet

The block coefficient has been decreased slightly with increased speed, giving a slightly finer ship for the higher speeds. Speeds of 9, 10, 11, 12 and 14 knots have been selected and the effective horsepower has been carefully calculated from model tank data. The propeller efficiencies have been taken from Taylor's $\rho\delta$ diagrams and the shaft horsepower has been increased 20 percent over that expected on trial to allow for increased power in service. All five ships are twin screw and the revolutions per minute have been made 115 for all the ships, which gives the 14-knot ship an advantage of about 10 percent in propeller efficiency over the 9-knot ship. If the revolutions per minute for the 9-knot were reduced to improve the propeller efficiency, the cost and weight of the machinery would increase, resulting in little if any overall gain.

The particulars of the five ships are tabulated in Table I. It will be observed that the gross deadweight decreases as the speed is increased, due to the heavier machinery weights in the faster ships. The net cargo deadweight also decreases, due to the decrease in the gross deadweight and to the increase in the fuel weight required with increased horsepower. The data and results of the operating expenses for a 5,000 mile voyage are given in Tables II and III. Line 17 in Table III shows that the freight rate to give a 10 percent return on the investment increases with speed and that the profit for a freight rate of \$7.03 per ton increases rapidly as the speed is decreased.

CAPITAL CHANGES DETERMINING FACTOR

The 9-knot ship has a net cargo deadweight capacity

*Head of course in Ship Construction and Marine Transportation, Lehigh University, Bethlehem, Pa.

It should be borne in mind that this comparison is for ships especially designed and powered for the speeds stated. It is not intended to indicate that a ship should be run at a speed less than that corresponding to its maximum power. If, for example, a speed of 10 knots can be obtained with a 9-knot ship without any increase in first cost or machinery weight, calculations of the operating expenses will quickly show that there is a distinct gain in favor of the 10-knot ship. As pointed out in the article, the high speed ship is handicapped not so much because of the increase in fuel costs as in reduced deadweight capacity and increased capital charges.

20.5 percent greater than that of the 14-knot ship, due to the saving in machinery and fuel weights; yet the 14-knot ship makes 3.7 more trips per year and carries 11,500 more tons (13½ percent) of cargo per year because of its greater speed. The 14-knot ship, however, loses out because of the greater capital charges (line 5, Table III), caused by the increased first cost of the larger power plant, and because of the increased fuel cost (line 6). The engine crew for the faster ship has been slightly increased by the addition of more oilers and a machinist-storekeeper. The port charges of the faster ship are also greater than those for the slower ship, due

to the greater number of turn-arounds effected per year. If the speed were reduced below 9 knots, in all probability an optimum speed would be found that would give a lower freight rate or a greater return on the investment than shown by the 9-knot ship. This comparison has not been carried below 9 knots, as it is felt that speeds lower than this and powers below 1,500 shaft horsepower are not to be recommended for a ship of this size.

The foregoing comparison clearly shows that there is no advantage in building a general cargo ship for speeds greater than 9 or 10 knots unless special inducements are offered in increased freight rates. When passengers, fruit, or refrigerated cargoes are carried, of course higher speeds are demanded and the earnings per ton of deadweight are greater.

The costs of the machinery, per shaft horsepower used in the above comparison have been assumed arbitrarily and may not agree with all types of Diesel machinery. They are, however, comparable and any reasonable change in the machinery costs will not affect the relative position of the ships in the table.

Table I.—Particulars of Ships

1. Sea speed in service.....	9	10	11	12	14
2. Block coefficient	.80	.79	.78	.76	.74
3. Displacement	14,500	14,300	14,100	13,800	13,400
4. Net tonnage	4,700	4,650	4,600	4,500	4,400
5. V/√L	.44	.49	.54	.59	.69
6. Model E. H. P.	740	1,000	1,290	1,620	2,600
7. Calculated S.H.P.+20% reserve	1,500	2,000	2,500	3,100	4,800
8. Hull weight	3,900	3,890	3,880	3,870	3,830
9. Machinery weight (lbs. per S.H.P.)	630	600	580	570	560
10. Machinery weight	420	535	650	790	1,200
11. Gross deadweight	10,180	9,875	9,570	9,140	8,370
12. Calculated fuel for 5,000 miles + 20%	205	250	280	320	425
13. Stores, provisions and water (tons)	50	50	50	50	50
14. Net cargo deadweight.....	9,925	9,575	9,240	8,770	7,895
15. Number of engine crew	12	15	15	15	16

Table II.—Data for a Voyage of 5,000 Miles

1. Speed in service..	9	10	11	12	14
2. Days on run + 5%	24.3	21.9	19.9	18.2	15.6
3. Fuel per S.H.P. per hour in service	.44	.44	.44	.44	.44

4. Fuel per hour at sea (lbs.)	660	880	1,100	1,365	2,110
5. Fuel per day (tons)	7.07	9.43	11.80	14.65	22.6
6. Rate of stevedoring (tons per hatch per hour)	30	30	30	30	30
7. Rate of stevedoring (tons per 10 hrs.)	1,500	1,500	1,500	1,500	1,500
8. Calculated time in port + 10%	14.55	14.10	13.55	12.85	11.60
9. Days per single trip	38.85	36.0	33.45	31.05	27.20
10. Single trips per year	8.63	9.30	10.0	10.80	12.30
11. Tons of cargo carried per year..	85,500	89,000	92,400	94,700	97,000
12. Cost of hull.....	\$720,000	\$720,000	\$720,000	\$720,000	\$720,000
13. Cost of machinery	\$280,000	\$350,000	\$420,000	\$510,000	\$750,000
14. Total cost of ship.	\$1,000,000	\$1,070,000	\$1,140,000	\$1,230,000	\$1,470,000

A summary of the data is given in Table IV. Line 5 shows the shaft horsepower installed per ton of cargo deadweight. It is seen that the cost of the ship increases with the increase in speed; yet the carrying capacity of the ship decreases. Line 7 in Table IV gives the annual operating expenses per ton of cargo carried per 1,000 miles traveled and shows the increase in expenses as the speed is increased.

In the foregoing comparison all the installations have been made twin screw, the cargo handling rate has been kept the same and all other factors kept constant where possible in order that speed should be the only variable. This does not work to the best advantage of the ships in each case but it does give a fairer comparison of speed than would be the case if other factors were varied.

In conclusion, the writer wishes to make clear that the comparison given above is based on assumed ships and theoretical conditions and the results are intended only for comparative purposes. They are not intended to apply to a particular isolated case.

Table III.—Annual Operating Expenses

1. Speed in service (knots)	9	10	11	12	14
2. Depreciation (5%).....	\$50,000	\$53,500	\$57,000	\$61,500	\$73,500
3. Insurance (5%).....	\$50,000	\$53,500	\$57,000	\$61,500	\$73,500
4. Repairs, maintenance, overhauling (4%).....	\$40,000	\$42,800	\$45,600	\$49,200	\$58,800
5. Total capital charges (14%)	\$140,000	\$149,800	\$159,600	\$172,200	\$205,800
6. Fuel used at sea at \$12.20 per ton.....	\$18,100	\$23,400	\$28,600	\$35,100	\$53,000
7. Fuel used in port at \$12.20 per ton.....	\$1,530	\$1,600	\$1,650	\$1,690	\$1,740
8. Lubricating oil at 75c. gallon	\$1,860	\$2,450	\$2,980	\$3,660	\$5,540
9. Wages of crew.....	\$36,000	\$38,340	\$38,340	\$38,340	\$39,540
10. Subsistence at 70c. per man per day.....	\$8,950	\$9,700	\$9,700	\$9,700	\$9,950
11. Tonnage dues and port charges	\$29,150	\$30,800	\$32,400	\$33,600	\$36,550
12. Brokerage and management at 50c. per ton..	\$42,750	\$44,500	\$46,200	\$47,350	\$48,500
13. Stevedoring at 70c. per ton	\$119,500	\$124,500	\$129,000	\$132,500	\$135,500
14. Annual operating costs..	\$398,000	\$425,000	\$449,000	\$465,000	\$536,000
15. 10% on investment...	\$100,000	\$107,000	\$114,000	\$123,000	\$147,000
16. Total	\$498,000	\$532,000	\$563,000	\$588,000	\$683,000
17. Rate per ton of cargo to give 10% return on investment	\$5.83	\$5.98	\$6.10	\$6.21	\$7.03
18. Profit for a rate of \$7.03 per ton.....	20.2%	18.7%	17.3%	16.2%	10%

Table IV.—Summary

1. Speed in service (knots)	9	10	11	12	14
2. Rate per ton to give 10% return	\$5.83	\$5.98	\$6.10	\$6.21	\$7.03
3. Profit for a rate of \$7.03 per ton	20.2%	18.7%	17.3%	16.2%	10.0%
4. Cost per ton gross D.W.	\$98.50	\$108.50	\$119.00	\$134.50	\$175.50
5. S.H.P. per ton of cargo D.W.	0.151	0.209	0.271	0.353	0.61
6. Cost of fuel used at sea per 1,000 cargo ton-miles	4.25	5.27	6.20	7.40	10.90
7. Annual operating cost per 1,000 cargo ton-miles..	\$0.93	\$0.96	\$0.975	\$0.982	\$1.105
8. Percentage of year at sea	57.5%	56.0%	54.5%	53.0%	52.6%

Distinctive Tendency Toward Self-Insurance Noted

Merchants Who Adopt Such a Course Run Grave Danger—Lack Facilities for Obtaining Prompt Knowledge of Disasters and Minimizing the Results

By "Bordereaux"

THERE is a slow but nevertheless steady growth in self-insurance among various classes of merchants in this country, and underwriters are regarding it with considerable concern. Within recent months there has been a noticeable movement in that direction on the part of large importers, especially chain department stores whose import business is chiefly confined to the movement of goods from Western Europe to the United States. Experiments in self-insurance are being made in the shipment of merchandise over the established transatlantic routes where voyages are relatively short and the best types of vessels are employed. It is an experiment of very doubtful advantage, for everyone familiar with the North Atlantic is aware of the uncertainty of the elements and of the nature of the severe and disastrous storms that frequently rage there.

In the long run, the law of average will certainly take its toll of the man who takes chances. There are innumerable accounts which have shown underwriters a profit, year in and year out, but where a sudden disaster has wiped out years of accumulated profit and left a debit balance. Other accounts seem fated to share in every possible bad fortune at sea; and these bring the insurer nothing but losses. The underwriter carries the good with the bad, because he operates

by the law of average. Should he have a disastrous year on the North Atlantic he can make up for it by better luck in other parts of the world, but the individual self-insurer has no such spread of risk, which is absolutely fundamental to a proper working out of this inexorable law. It is economically unsound for shipowners or merchants to risk their profits in an experiment where the cards are stacked against them; and particularly is this so in a branch of insurance such as marine, where the profits are notoriously small. Rates on imports of general cargo from Europe are lower at the present time than for years, which reflects the relative freedom from serious losses. The shipper has the benefit of these low rates; why, then, should he run the risk of incurring a severe loss which will wipe out his insurance reserve and leave him with a charge on the wrong side of the ledger? Again, the self-insurer is without the machinery necessary for obtaining prompt notice of disaster, which permits the underwriter to take steps to minimize the loss or preserve the venture. Furthermore, in cases of general average there are many complicated situations which arise, and unless the proper steps are taken loss and embarrassment may readily result to the shipowner or shipper, depending upon the circumstances involved in the case.

Hague Rules Endorsed

THE idea of a uniform ocean bill of lading has appealed strongly to the Chamber of Commerce of the United States. At its recent annual meeting, the Transportation Group adopted the following resolution, which was proposed by D. Roger Englar, who represented the Association of Marine Underwriters of the United States:

Whereas, The Chamber of Commerce of the United States at its tenth annual meeting, held in Washington, D. C., in 1922, put itself on record as indorsing The Hague Rules, 1921, as a step in advance and asked Congress to enact legislation for The Hague Rules with such interpretations as may be deemed necessary; and

Whereas, These rules have been further modified and are now before us in the form of the Brussels Draft International Convention for the Unification of Certain Rules Relating to Bills of Lading; therefore, be it

Resolved, That this chamber approves the said Brussels Draft International Convention as an improvement over The Hague Rules and asks Congress to enact legislation putting the said Draft International Convention into effect.

Restriction in English Clauses

ENGLISH underwriters announce important alterations in their hull contract. They have decided not to include hereafter the four-fourths "running down" clause, nor protection and indemnity risks in time policies, except in case of liners and other special service vessels in which such risks have regularly been included in the past. This agreement applies to all insurance placed on English conditions.

In Great Britain it is generally regarded that the granting of full collision cover and the writing of P. & I. risks has extended beyond the bounds of underwriting safety. It has always been accepted that one-fourth of the collision risk ought to be run by the owner. The latter joins with other owners in mutual associations, and shares with them the claims that arise from writing vessels in common. These associations play the leading role in the adjustment of collision liability claims. They also cover protection and indemnity risks in full. The English authorities insist that "in eliminating the one-fourth collision liability and the whole of P. & I. risks from the marine policy, underwriters are assuring the associations of a continuance of business and, at the same time, assuring themselves of the continuance of the excellent service which these associations undoubtedly render the market."

Carrier's Floating Policy

LIABILITY under a general floating marine policy taken out by a carrier covering goods to be shipped by the latter was gone into recently in a case before the New York Supreme Court, Appellate Division, 199 New York Supp., 46. The court held that under such conditions as arose in this case the shipper is entitled to sue the insurer for loss sustained under such a contract and need not be relegated to their claims as general creditors against the bankrupt carrier.

The suit was on appeal from the Supreme Court. It was brought by Nicholas P. Young and another, as co-partners, against the St. Paul Fire and Marine Insurance Company and another. The plaintiffs were engaged in the bagging business, and shipped 298 bales of gunny bags with the Inland Waterways Steamship Corporation which had a policy with the several insurance companies covering goods shipped by it "for account of whom it may concern." The goods were destroyed by fire due to lightning. The insurer re-

sisted payment on the ground that the carrier was the insured and the party through which all rights of shippers in the first instance should be enforced, and that the equitable rights of plaintiffs under the policy were limited to their proportion of such sums as might be recoverable by the carrier, or its receivers. The receivers of the carrier raised the contention that the policy was one of reinsurance, to re-insure the carrier for losses it might be obligated to adjust with the shipper, and for which it should be liable, and that therefore the plaintiffs had no interest in the proceeds of this insurance, and were not entitled to recover in this action, being only general creditors of the carrier. The court held that these contentions were without merit, and that the insurance on the bags was effected for the benefit of the plaintiffs.

Leviathan's Insurance

WHEN the world's largest vessel, the *Leviathan*, passed out of the Newport News yards, where she had been reconditioning for the past thirteen months, her insurance automatically expired. Thereafter she was without coverage, except as the risk of the Shipping Board boats are regularly taken care of by the Government. Her policy had been for \$2,500,000, written in Syndicate "C." It attached April 10, 1922. The expiration was given as of May 20, 1923, "or until the vessel sails from Newport News." The underwriters had but comparatively few claims to meet during the cover period, and the insurance operation, taken as a whole, was profitable to the insurers and eminently satisfactory to the vessel's owners.

Marine Fire Hazards

AT the recent annual meeting of the National Fire Protection Association, held at Chicago, the report of the Marine Fire Hazards Committee was accepted and adopted as submitted without a change. This was a well-earned tribute to the fine work done by Mr. S. D. McComb and his associate committeemen. The committee was continued, and will now proceed to devote its attention to problems respecting hazardous commodities, gas engines and gasoline boats. They made certain recommendations along these lines, which were tentatively adopted, but they will require to be gotten into permanent shape. Hazardous cargoes come under the jurisdiction of the Interstate Commerce Commission. The committee earnestly invites criticism and suggestions from steamship owners, to the end that the handling of these subjects may be as comprehensive and satisfactory to all concerned as is at all possible.

Improper Recording of Bill of Sale

IN the case of the *Jean L.*, 286 Federal Reporter, 727, the claimant had a bill of sale on the vessel, which was recorded in the office of a State court, that was offered in evidence at the time of the trial in an attempt to show a prior lien but the Court said a bill of sale on a vessel is not admissible as evidence of title where it was not recorded in the office of the collector of customs, in the home port of the vessel as required by Rev. St. Sec. 4192 and there was no evidence that the claimant had any knowledge of the existence of the bill of sale. The recording of the bill of sale in the office of the clerk of a State court does not give constructive notice to a subsequent lien claimant, since the provisions of the United States laws and not those of the State apply to transfers of vessels or interests in them and especially where there is no State law authorizing bills of sale of personal property to be recorded by that court.

Protective Coverings for Shipbuilding Purposes: Paints

By Horace Holden Thayer *

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

IN a consideration of paints as a protective covering for shipbuilding purposes we will find it advantageous to group them in several classes, such as

- Priming paints
- Bottom compositions
- Interior paints, general
- Exterior paints, general
- Paints for special services
- Varnish and shellac

Before taking up any one of the paint mixtures it will be well to present specifications of the materials which go to make up the vehicle, or liquid portion, of the paint. They are oil, which generally should be pure linseed oil, turpentine, volatile mineral spirits and a drier. Linseed oil is what is known as a drying oil, that is, an oil which when spread out in a thin film readily takes up oxygen from the air and changes to a tough and elastic substance. Specifications for these, as drawn up in 1918 by the War Service Committee of the Paint Industry for shipbuilding purposes, may be considered as representative of good practice. These specifications, together with the same specifications for varnish, are given below. Shellac is merely gum shellac dissolved in alcohol.

In addition to linseed oil, China wood or tung oil and soya bean oil are of value in some paints. The former has great cohesion and good water proofing properties, while the latter is particularly of value for its adhesive properties. The use of soya bean oil makes a slower drying paint.

RAW OR REFINED LINSEED OIL

It shall be absolutely pure, well settled oil of best quality. It shall be perfectly clear at a temperature of 60 degrees F. and shall not show a loss of over 0.2 percent when heated to 212 degrees F., or show any deposit of "foots" after being heated to this temperature. It shall conform to the following requirements:

	Maximum	Minimum
Specific gravity at 15.5 degrees/15.5 degrees C.....	0.936	0.932
Or specific gravity at 25 degrees/25 degrees C.....	0.931	0.927
Acid number	6.	.....
Saponification number	195.	189.
Unsaponifiable matter, percent.....	1.50	.....
Refractive index at 25 degrees C.....	1.4805	1.479
Iodine number (Hanus).....	.....	170.

These specifications agree with standard specifications D77-21T of the American Society for Testing Materials except that the latter use only the specific gravity at 15.5 degrees C. and have 0.931 as the minimum, and call for a minimum refractive index of 1.478.

BOILED LINSEED OIL

It shall be absolutely pure, well-settled linseed oil boiled with oxides of manganese and lead. It shall conform to the following requirements:

	Maximum	Minimum
Specific gravity at 15.5 degrees/15.5 degrees C.....	0.945	0.937
Acid number	8.	.....
Saponification number	195.	189.
Unsaponifiable matter, percent.....	1.5	.....
Refractive index at 25 degrees C.....	1.484	1.479
Iodine number (Hanus).....	.....	168.
Ash, percent	0.7	0.2
Manganese, percent .....	.....	0.03
Lead, percent .....	.....	0.1

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

These specifications agree with standard specifications D77-21T of the American Society for Testing Materials except that the latter use only the specific gravity at 15.5 degrees C. and have 0.936 as the minimum, call for a minimum refractive index of 1.478, and specify a maximum of 0.3 percent calcium.

TURPENTINE

This specification applies both to the turpentine that is distilled from pine oleoresins, and commonly known as gum turpentine or spirits turpentine, and to the turpentine commonly known as wood turpentine that is obtained from resinous wood, whether by extraction with volatile solvents, by steam, or by destructive distillation. The bidder should state whether gum spirits or wood turpentine is furnished.

The turpentine shall be clear and free from suspended matter and water. The color shall be water white. The specific gravity shall not be less than 0.860 or more than 0.875 at 15.5 degrees C. The refractive index shall be not less than 1.468 or more than 1.478 at 15.5 degrees C. The initial boiling point shall be not less than 150 degrees C. nor more than 160 degrees C. Ninety percent of the turpentine shall distill below 170 degrees C. The polymerization residue shall not exceed 2 percent and its refractive index at 15.5 degrees C. shall not be less than 1.500.

The American Society for Testing Materials standard specifications D13-21T are approximately the same as this, but in some particulars they make a distinction between the requirements for gum spirits and those for wood turpentine.

VOLATILE MINERAL SPIRITS

This shall be a hydrocarbon distillate, water white, neutral, clear and free from water. It shall have no darkening effect when mixed with basic carbonate-white lead.

When 100 cubic centimeters are submitted to continuous distillation in an Engler flask with a condenser 22 inches long at an angle of 30 degrees with the horizontal, and cooled with water, the first drop shall issue from the condenser at a temperature of not less than 265 degrees F. and 97 percent shall distill below 470 degrees F.

When 100 cubic centimeters of the distillates are placed in a glass crystallizing dish 2½ inches in diameter in a steam bath maintained at a temperature of 212 degrees F., and evaporated, not more than 2/10 of 1 percent of residue shall remain after 2½ hours. The flash point shall be not less than 85 degrees F. when determined by the closed Abel tester method, the test being made in the usual official manner.

DRIER

It shall be composed of lead, manganese, or cobalt salts, or a mixture of any of these elements, combined with pure linseed oil and thinner. The thinner shall consist of approximately 75 percent volatile mineral spirits and 25 percent turpentine. It shall be free from adulterants, sediment and suspended matter. Resins or "gums" other than resin may be used at the option of the manufacturer (but the presence of resin in any form shall be cause for rejection). The drier shall not flash below 35 degrees C. (95 degrees F.) in an open tester. When the drier is thoroughly mixed with linseed oil that will not break under 315 degrees C. (600 degrees F.) in the proportion of 5 volumes of drier to 95 volumes of oil, no curdling shall result within 2 hours after mixing, and the mixture when flowed on a clean glass plate held in a vertical position, shall dry in not more than 18 hours at a temperature between 15 degrees and 35 degrees C.

VARNISH

The material shall be the best long oil varnish. It must be resistant to air, light and water. The manufacturer is given wide latitude in the selection of raw materials and processes of manufac-

ture, so that he may produce a varnish of the highest quality. Preference will be given to the rapid drying varnishes.

The varnish shall be clear and transparent.

The color of the varnish shall be no darker than that of a standard color solution, made by dissolving six grams of pure powdered potassium bichromate in 100 cubic centimeters of pure concentrated sulphuric acid (Specific gravity 1.84). Gentle heat may be used if necessary to perfect the solution of the bichromate. The standard color solution and a sample of varnish shall be placed in clear thin-walled glass tubes of the same diameter. The color comparison shall be made by placing the tubes close together and looking through them. The tubes used for this test shall be $\frac{5}{8}$ to $\frac{13}{16}$ inch in diameter, and shall be filled with the liquids to a depth of at least one inch.

When tested in an open tester, the varnish shall not flash below 95 degrees F. (35 degrees C.).

The film test shall be made on a film of varnish flowed on one side of a panel of bright tin which is 0.0125 to 0.0158 inch thick and about four inches wide by six inches long. The panel shall be thoroughly cleaned with benzol before applying the varnish. When the panel is placed in a vertical position and maintained at a temperature of 70 to 90 degrees F. (21 to 32 deg. C.), the varnish must set to touch at points within one inch of the side and top edges of the film, in not more than five hours and must dry hard in not more than twenty-four hours, to a clear hard glossy film.

The panel shall then be allowed to dry for a further period of not less than five days, and then brought to a temperature of from 70 to 75 degrees F. The panel with the varnished side on the outside, shall then be rapidly bent double over a rod $\frac{3}{8}$ inch in diameter. The varnish film must neither crack nor flake at the point of bending.

A basswood panel shall be filled with a coat of drop black in oil, thinned with turpentine and drier, and allowed to dry for at least ten days. The filler must have suitable body to give proper brushing, flowing and covering properties. A coat of varnish shall then be applied, allowed to dry for forty-eight hours and lightly sandpapered. A second coat of varnish shall then be applied and allowed to dry for seventy-two hours. The panel shall then be inclined at an angle of forty-five degrees, and a gentle stream of cold tap water allowed to flow for eighteen hours down the middle of the panel. After wiping off, with a chamois skin, any deposits due to tap water the varnish must show no appreciable whitening, dulling or other defects. A small stream of boiling distilled water will then be allowed to flow down another portion of the panel for twenty minutes. The water will be siphoned through a small glass tube directly from a container in which it is boiling, onto the surface of the panel, in such a manner that there will be no appreciable lowering of the temperature of the water before it touches the varnish film. The siphon delivery tube will be in a plane nearly parallel to the plane of the panel, so that the impact of the water will not tend to break the film. The varnish shall show no appreciable whitening and no more than a very slight dulling, or other indications of marked deterioration, either when observed immediately after removing from the water, or after drying for two hours.

The varnish shall be applied, in three coats, to two unfilled panels of maplewood. The panels must not be less than $5\frac{1}{2}$ inches wide by 18 inches long by $\frac{3}{4}$ inch thick. The first coat of varnish, after drying indoors for three days, shall be lightly sandpapered with No. 00 sandpaper before the application of the second coat. The second and third coats of varnish shall each be allowed to dry three days indoors, but neither coat shall be sandpapered or rubbed. A protective coat of varnish (not for test purposes) shall be applied to the back and edges of the panels. The duplicate panels shall then be placed outdoors at an angle of 45 degrees to the vertical and facing the south.

The durability of the varnish on the test panel must be equivalent to that of an approved varnish exposed under the same conditions.

The American Society for Testing Materials has standard specifications for a number of the more important paint pigments, which are of value as quality standards. They also have standard specifications for tung oil.

PRIMING PAINTS

The first coat of paint applied to the bare steel, wood or other material is the priming coat, and it naturally first demands our attention. A good priming paint is very important.

PROTECTION OF STEEL

Steel and iron are painted to protect them from corrosion which results from exposure to moisture and is accelerated by the presence of salt and other elements or conditions which induce galvanic action. A priming paint for steel work

should therefore be as impermeable as possible, should contain nothing soluble in water or that would attack the steel, should be a non-conductor of electricity and should contain nothing that would act with the steel to set up galvanic action. If it is of a nature to neutralize attacking acids in the air or water, so much the better. In addition to these qualifications the paint should adhere tenaciously to the surface and should form a good and hard foundation for subsequent coats. A soft film as a priming coat will result in the cracking and alligating of the subsequent coats.

The steel should be scraped or wire brushed clean of mill scale and dirt and made thoroughly free of oil, and it should be thoroughly dry. Lubricating oil or palm oil is sometimes rubbed over the surface to prevent corrosion during shipment and this will prevent the adherence of any paint. One of the best removers of such oil is benzene.

The oil used in priming paints for steel work should be pure linseed oil, preferably entirely raw. No mineral oil or non-drying oil of any kind should be used in it, as they prevent the paint's becoming sufficiently hard to give a good foundation for subsequent coats. Linseed oil when used as a coating without pigment makes a film that is too soft, as well as being somewhat porous and permeable, but when used with a pigment the film will dry hard. Boiled linseed oil produces a paint film which is harder and resists the softening action of water better than raw linseed oil, and this renders the former more desirable for outer coats, particularly where the coating is constantly in contact with water.

RED LEAD

Red lead is made by melting lead metal in furnaces and oxidizing it to litharge (PbO), a buff colored oxide. This when pulverized and again heated to the proper temperature takes on more oxygen and changes to red lead (Pb_3O_4), though there will usually be a small percentage of litharge unconverted. Too high a heat will result in a transformation of the red lead back to litharge again. The difficulty of producing a red lead entirely free from litharge may be readily imagined. Litharge is easily decomposed and enters into other chemical combinations, and it also, when in any considerable amount, acts on the oil causing the paint to become rosy and resulting in the objectionable caking of the pigment when the paint is allowed to stand. An excessive amount of litharge in red lead indicates that the pigment has not been ground finely enough and thus the presence of coarse particles which interfere with obtaining a good uniform paint film. Red lead produced by the oxidation of white lead is often called orange mineral, and a more complete oxidation and a resultant low percentage of litharge is more easily obtained by this process, but it is not always so obtained. One paint manufacturer states the composition of their orange mineral as 95.71 Pb_3O_4 and 4.29 percent PbO .

No priming paint thus far evolved has been proved by actual experience to equal a paint composed of pure red lead and pure linseed oil in the marine field. There is no other paint that makes such a hard, tenacious film. It is a good protection against electricity and acids. It stands high as regards impermeability, having a good thick film with a maximum of pigment. Red lead and pure linseed oil paint contains nothing soluble in water, and it dries rapidly through and through. The bright orange red color is also of value on a steel surface as showing up defects in the application of the coating.

An objectionable feature in the use of pure red lead paint is the fact that with the use of the red lead powder generally obtainable, the pigment soon settles to the bottom and cakes in a manner which prevents its proper mixing up again. The reason for this has been mentioned. This fact has in the past required that the paint be mixed fresh for the particular work in hand. In order to simplify this process one man-

ufacturer has for some years produced a red lead ground in linseed oil and sold in paste form, and quite recently they have gone a step farther and produced a liquid red lead paint. This has been made possible by the use of finely ground and highly oxidized red lead containing not less than 97 percent of Pb_3O_4 . The use of the pigment in paste form or the use of the liquid red lead paint obviates another objectionable feature, which is the danger of poisoning from the red lead powder when proper precautions are not taken by the user.

Paint specifications adopted in 1917 by the United States Shipping Board Emergency Fleet Corporation were prepared by Dr. P. H. Walker of the United States Bureau of Standards in collaboration with Dr. H. A. Gardner of the Institute of Industrial Research, Washington, D. C. For red lead paint they are as follows:

HAND MIXED RED LEAD PAINT

This paint shall be mixed not more than 48 hours before application. The pigment shall be pure oxides of lead containing not less than 85 percent Pb_3O_4 , the balance to be PbO . The paint shall weigh not less than 25 pounds to the gallon. The vehicle shall consist of pure raw linseed oil, liquid drier and volatile thinner (turpentine or mineral spirits, or a mixture thereof). It shall be free from resin. When applied to a smooth vertical iron surface, the paint must dry free from tack in twelve hours without running, streaking or sagging. Such a paint may be made on the following formula:

Red lead	20 pounds
Raw linseed oil	5 pints
Petroleum spirits	2 gills
Liquid drier	2 gills

The formula is the United States Navy formula for red lead priming paint although they require that the pigment shall contain not less than 94 percent of true red lead, Pb_3O_4 . When the paint is made up with red lead paste the Navy Department requires that it shall contain not less than 97 percent of Pb_3O_4 , so that it will not harden in the container. The paint weighs 25 pounds 4 ounces per gallon. It will be noted that the proportions are 32 pounds of red lead to 1 gallon of oil.

Thirty-three pounds or more of red lead to 1 gallon of oil can be used with profit. With about one-third of the oil boiled no drier is necessary, and the formula can consist of red lead and linseed oil alone. The more red lead to a gallon, the harder will be the paint, and the better for underwater service.

Dr. A. H. Sabin, an authority on red lead paints, in his book "Red-Lead and How to Use It," recommends the following for the painting of the *outside* of the hull: As soon as the shell plates are in place, a coat of red lead paint made with boiled linseed oil containing 40 pounds of pigment to the gallon of oil. A similar second coat below the water, with a second coat above the waterline having 36 to 37 pounds of pigment to the gallon of oil. Then a third coat having 33 pounds of pigment to a gallon of boiled oil below the waterline, and the same amount of pigment with the oil half raw and half boiled, above the waterline. He recommends as long a time as possible between coats, even up to a year if the vessel is to be three years on the ways after being plated.

The paste red lead before referred to can be mixed up with linseed oil to produce any desired weight of paint. The proportions for the equivalent of 33 pounds of dry red lead to the gallon of oil are 24.29 pounds of the paste to 0.48 gallon oil and the resulting weight per gallon is 28 pounds.

The formula for the ready mixed liquid red lead paint before mentioned in its natural orange-red color is—

Red lead	79.69 percent by weight
Linseed oil	19.31 percent by weight
Liquid drier	1.00 percent by weight

100.00 percent

The paint weighs 28 pounds per gallon, being heavier than the United States Navy standard paint, and one gallon contains about 22.3 pounds of red lead and 5.4 pounds of linseed oil. Taking the minimum specific gravity for linseed oil before mentioned at 0.932 we would have only 0.696 gallon of oil. This shows a proportion of about 32 pounds of red lead per gallon of oil, or the equal of the hard mixed paint before mentioned.

LEAD CHROMATE

The value of lead chromate as a pigment for priming paints on steel subjected to salt air is evidenced by tests made by the American Society for Testing Materials which will be more fully referred to later on. The paint of this nature made up by them stood at the top of the list. One of the paint manufacturers is marketing a paint of this type which is giving a good account of itself on ships, coal piers and other work about the water, and it has been passed upon by Dr. H. A. Gardner as promising excellent service on iron and steel structures. The formula for this paint is—

Pigment 45 percent	Lead chromate	25 percent
	Iron oxide (91 percent iron) ..	25 percent
	Silica	50 percent
Vehicle 55 percent	Linseed oil (heat treated)	64 percent
	Varnish, long oil, hard gum....	20 percent
	Drier (oil)	10 percent
	Thinner (turpentine)	6 percent

BLUE LEAD

At least one manufacturer of priming paints is marketing a product called sublimed blue lead in oil. The pigment, which is produced by subliming lead ore and collecting the fumes, is a slate gray powder and it is about half lead sulphate. It is said to remain perfectly suspended in the vehicle and at the same time to be free from hardening in the container.

This paint is another of those in the before mentioned tests of the American Society for Testing Materials and was awarded a rating second to that of the lead chromate paint. The composition of the pigment as used in the tests was approximately:

Lead sulphate	50 percent
Lead oxide	35 percent
Lead sulphide	5 percent
Lead sulphite	5 percent
Zinc oxide	2 percent
Carbon	3 percent

The writer does not know of any instances of its actual shipboard service, but it looks promising.

(To be continued)

Applications of Arc Welding to Ship Construction

(Continued from page 424)

a paper read by Mr. Wall, before the British Institution of Mechanical Engineers in 1922: "This ship has been in commission for about 18 months. The welding employed in her construction has proved highly satisfactory. She has carried several cargoes of steel plating and similar material and has encountered heavy seas without showing signs of failure in any welded joint. At one time, in a collision, she received an indentation in her side without starting any welding. Lloyd's Register of Shipping recently examined this ship and reported that there were no signs of weakness, even at the break of the quarter deck, which usually happens with riveted vessels of this class."

(To be continued)

Current Admiralty Decisions of Special Interest

By Calvert B. Gill*

Liability for Damage to Cargo

THE plaintiff in the case of the *Lake Fontanet*, American Maritime Cases Vol. 1, page 500, filed a libel to recover for damages to the cargo. The libel charges that the coffee was damaged by sweat and water by reason of it not being stowed with proper dunnage and by reason of the master and crew not taking proper precaution in the custody and care of the cargo. The defence offered was a provision of the bill of lading relating to sweating and that the dunnage was done in the manner usual and customary in the coffee trade, but the Court said although the damage resulted to the cargo from an excepted cause, yet if it could have been avoided by the exercise of proper skill and vigilance, the carrier was liable. That it is negligent to stow coffee with usual battens and matting for a voyage from a warmer to a colder climate, when sweating of the ship's hold could have been anticipated and other and safer methods of stowage could have been used.

Award for Services Little Above Towage

IN attempting to secure a large reward for salvage by towing a schooner a distance less than one hundred miles the Court in *The Lewis Brothers*, 287 Federal Reporter, 143, said that where the services for which salvage was claimed consisted of towing a schooner for ninety-five miles, which occupied about thirteen hours and delayed the steamer doing the towing only about ten hours, without requiring any substantial deviation from her course, so that the service amounted to but little more than ordinary towage, an award of \$500 as salvage is sufficient and since only ordinary work was required of the crew of the towing vessel, the entire award should go to the owners of the vessel.

Conditional Sale Contract Does Not Authorize Liens

A CONDITIONAL contract for the sale of a vessel did not, by a provision that the buyer should discharge any liens against the vessel within 15 days, grant the buyer power to impose liens on the vessel where that was contrary to the intention of the parties, as manifested by a requirement that the buyer should carry a certified copy of the agreement and take such other appropriate steps as would give notice that he has no authority to suffer a lien to be imposed on the vessel, but was inserted in recognition of the fact that under certain circumstances those dealing with the ship would have a lien, despite the terms of the contract. *The Henry S. Grove*, 287 Federal Reporter, 247.

Jurisdiction of Action for Injuries on Dock

THE plaintiff, who was employed as a mess boy to serve meals to the seamen and do any work required in the steward's department of the ship, was ordered by the first mate, over the plaintiff's objection, upon the wharf

to assist in the unloading of the ship and while so employed was injured by the negligently dropping of a loaded cargo sling upon him, endeavored to recover damages from the owners of the ship under the Merchant Marine Act of 1920, section 33, but the Court in *Hughes vs. Alaska Steamship Company*, 287 Federal Reporter, 427, said that the court has no jurisdiction of a suit instituted under the Merchant Marine Act of 1920, section 33, providing that any seaman who shall suffer personal injury in the course of his employment may at his election maintain an action for damages at law; no intention being shown by section 33 to include in the new remedy any cases in so far as territorial jurisdiction is concerned, not covered by the Act of March 4, 1915, section 20.

Ship Liable for Negligent Care of Seaman

IN the case of *Unica vs. United States*, 287 Federal Reporter, 177, the libelant seeks to recover damages, not because of the injury sustained when he accidentally fell into the hold of the vessel, but because of the negligence of the master in not getting him into a hospital sooner, so he could receive proper surgical attention. The Court said that the ship owes the seaman the duty of maintenance and care when he is seriously injured and if there is no surgeon on the vessel, it is the duty of the master to have him taken to a hospital at a port which would have resulted in but slight deviation from the vessel's course or, if the seaman waived his right to be taken to that hospital, the master was negligent in failing to have him removed to a hospital at the ship's destination for six days after the arrival of the ship in that port. Where such negligence exists the ship's owner is liable in damages.

Charterer Liable for Demurrage

WHERE a charter party required the vessel to be delivered at designated port between specified days, charterer to deliver cargo alongside and to load and discharge in five weather working days, or failing to do so to pay demurrage, lay days to commence from the time the captain reports ready to receive cargo and loading was delayed because of limited port facilities requiring vessel to wait its turn, the charterer was liable for demurrage, as it knew or should have known of the conditions and custom of loading at such port and contracted with reference thereto. The Court further states, that under charter parties requiring the charterer to pay demurrage after the expiration of the loading time agreed on and fixing lay days as commencing from the time the captain reports himself ready to receive or discharge cargo, the commencement of the lay days is at the expiration of such period after the service of notice of arrival by the master as the ship would require in the exercise of due diligence to haul to her wharf or pier, if the same were then provided. *The Lake Yelverton*, 288 Federal Reporter, 92.

A NEW DRYDOCK, 160 feet long, 44 feet beam, to accommodate vessels up to 175 feet long and weighing 5,000 tons, was opened on June 25 by the Riley Drydock Company, foot of Mechanic Street, Buffalo, N. Y.

* Attorney at Law, Baltimore, Md.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Formula for Bow Wave Length and Contour

Q. (1,201).—Can you give me a formula for the determination of the bow wave length and contour for a moving boat or ship?

A. (1,201).—Admiral Taylor, in "Speed and Power of Ships," Volume I, pages 73 to 76, discusses Wave Resistance generally. On page 74 he states that, if V is the speed of the ship in knots, the length of the bow wave from crest to crest is $0.5573 V^2$.

On pages 108 to 111 he discusses squat and change of trim. The following is quoted from pages 110 and 111:

"Squatting is often thought to be a cause of excessive resistance. As a matter of fact, it is simply a result of large bow wave resistance. At $\frac{V}{\sqrt{L}} = 1.1$ to 1.2 the first hollow of the bow wave

is somewhere near amidships and the second crest somewhere forward of the stern holding it up, as it were. With increase of speed the crest moves aft clear of the stern and the hollow moves aft toward the stern. The stern, of course, drops into this bow wave hollow, causing the squatting or rapid change of trim noticed. As speed is increased the hollow in turn moves beyond the stern and the vessel advances on the back of its own bow wave, as it were. The higher the speed, the longer the bow wave, and the closer the vessel is to the crest.

"It is perfectly true that marked squatting generally means great resistance, because it is the result of an excessive bow wave with a first deep hollow. With no bow wave there would be no squatting, and with slender models having small bow waves squatting is much less marked than for short full models. In every case, however, it is a symptom rather than a cause of resistance."

With very short boats driven at very high speeds the second crest is far aft of the stern, so that the boat itself is on the back of its own bow wave, but very close to its crest.

It is probably impracticable to derive the wave contour of a given boat theoretically. Perhaps a reasonable approximation to it might be made by developing a trochoidal wave of the length given by the above formula and a reasonable proportion of height to length.

It is noticeable in tests that while for a given model the ratio, length to height of bow wave, seems fairly constant with varying speeds, this ratio varies widely from model to model depending upon the type of the forebody. Hence, the selection of the proper value for this ratio would depend upon observation of either models or boats of the type contemplated.

Clearances for Pins and Journals

Q. (1,202).—Could you give me some rule by which I could determine the amount of clearance to allow on bearings and pins on different types and sizes of marine engines? I noticed a rule given by Dyson in his handbook, but this does not seem to hold good; also, could you recommend a book on this subject that would be suitable for merchant ship engineers? J. W. A.

A. (1,202).—The best information on this subject with which the writer is acquainted is tabulated below and is taken

from the section on "Reciprocating Engines" prepared for Sterling's Marine Engineers' Hand Book by Wayne T. Dimm, B.S., assistant chief engineer, Newport News Shipbuilding and Dry Dock Company.

Satisfactory Clearances for Pins and Journals

Clearances in Inches for Pins		Diameter in Inches	Clearances in Inches for Journals	
Max.	Min.		Max.	Min.
0.005	0.002	5	0.005	0.0025
0.008	0.004	10	0.010	0.005
0.012	0.006	15	0.015	0.0075
0.015	0.008	20	0.020	0.010
0.018	0.010	25	0.025	0.0125

Bearing Clearances in Inches for Large Engines in Good Alinement

Crosshead pin brasses.....	0.006 to 0.007
Crank pin brasses.....	0.008 to 0.009
Main bearings.....	0.009 to 0.010
Eccentric straps.....	0.010 to 0.015
Crosshead slippers.....	0.010 to 0.012
Thrust shoes.....	0.005 to 0.007

Permissible Clearances on Lignum-Vitæ Bearings

Diameter of Journal in Inches	Minimum Clearance in Inches for New Bearings	Wear in Inches at Which Bearings Should Be Removed
8.....	0.050	$\frac{1}{4}$
10.....	0.060	$\frac{1}{4}$
12.....	0.075	$\frac{1}{4}$
16.....	0.100	$\frac{3}{8}$
20.....	0.125	$\frac{3}{8}$

Lignum vitæ must be well water soaked before being bored out.

Efficiency of Surface Propellers

Q. (1,203).—How does propulsion by surface propellers, as exemplified by the Hickman drive, compare in efficiency with that of the ordinary submerged propeller?

A. (1,203).—This is a large subject and one which has not yet been thoroughly investigated. The surface propeller and the vane propeller, now being developed in England, are both propellers which are designed to operate at partial submergence. The hub of the surface propeller is just above the surface of the water when the vessel is under way. Only the blade tips of the vane propeller act on the water. It results that the resistance of the shafting and struts or bossing is eliminated when either the surface or the vane propeller is used. This resistance amounts to from 5 to 10 percent of the bare hull resistance of twin screw vessels of moderate speed length ratio. In faster vessels it may be still greater.

Certain experimental basin tests indicate that a propeller, when not behind a hull, is more efficient when working as a submerged than when working as a surface propeller. This superiority is of the order of 6 to 8 percent.

The experience gained with a small vessel equipped with vane propellers shows a gain in propulsive efficiency of from 20 to 30 percent as compared with the same vessel fitted with submerged propellers.

Both the vane and surface propellers involve large diameters and low revolutions as compared with the submerged propeller designed for the same power. The result is slow turning machinery or the introduction of gearing. In either case, increases of weight and space are involved.

Accordingly, it would appear that both surface and vane

propellers merit the careful consideration of the designer. The exact value relative to that of the submerged propeller and the services or types of vessel to which they are particularly adapted are yet to be accurately determined.

Use Area of Largest Section in Calculating Prismatic Coefficient

Q. (1,204).—In calculating the value of the prismatic coefficient for a vessel whose largest sectional area is not at her half length should the area of the largest section or that of the section at the half length be used?

A. (1,204).—The area of the largest section is always to be used regardless of its fore and aft location. For purposes of design the value of the prismatic coefficient lies in the conception which it conveys to the designer of the longitudinal distribution of the vessel's displacement. The most important features of this distribution are the fore and aft location and value of the area of the greatest section. Upon these two features largely depend the shapes of the curves of sectional areas both of the fore and after body. This knowledge is of great importance in powering ships. The area of the section at mid length has little bearing upon resistance or power except (as is generally the case) when it is the section of greatest area.

PERSONAL MENTION

FRANK I. THOMPSON, commissioner of the United States Shipping Board, has been reappointed as a Shipping Board commissioner for a six-year term.

J. J. DWYER, special assistant to the passenger traffic manager of the United States Lines, has been appointed manager of the third class department of the company.

MORRIS MALKIN has resigned as head of the chartering department of the United States Shipping Board to rejoin the staff of Daniel Bacon, agent of Elder Dempster and Company, Ltd.

BERT E. HANEY, a lawyer of Oregon active in democratic politics, has been appointed a member of the United States Shipping Board, succeeding former Senator George E. Chamberlain. Mr. Haney is a member of the law firm of Joseph, Haney and Littlefield, which specializes in the practice of business and commercial law.

HARRY E. DEVOY has been appointed manager of the New York office of the J. H. W. Steele Steamship Lines succeeding B. M. Flippin who has retired after serving for the past four years as vice-president, traffic manager and head of the New York office of the company. Mr. Devoy was formerly Mr. Flippin's assistant.

WILLIAM LAMBIE, a Scotch naval architect and yacht designer, has established headquarters at Los Angeles harbor, Cal., where he is designing pleasure yachts and service power boats. During the World War Mr. Lambie was naval architect for the Southwestern Shipbuilding Company at Los Angeles and had charge of the construction of twenty-five steamers built at the plant for the Emergency Fleet Corporation and private interests.

CAPTAIN A. T. HUNTER, for the past three years operating manager of the General Steamship Corporation, San Francisco, has been appointed marine superintendent of the United States Lines with headquarters in New York. Prior to joining the General Steamship Corporation Captain Hunter was with the Pacific Mail Steamship Company. At the outbreak of the World War he joined the troopship *Northern Pacific* as commander and, under his direction, the vessel made a record in transporting troops across the Atlantic.

CAPTAIN H. H. BIRKHOLM, formerly northwest manager of the General Steamship Corporation, has been appointed operating manager of the corporation succeeding Captain A. T. Hunter.

DANCHERT SMITH, of Arnesen, Christensen and Smith, naval architects and consulting engineers, Christiania, Newcastle-on-Tyne and Cardiff, a firm which has a large clientele among Scandinavian



Danchert Smith

shipowners, has recently been created a Doctor of Science with highest honors, at the Technical University of Danzig. This degree was awarded on Dr. Smith's important paper, "Ueber die Drehfestigkeit der Schiffe (Torsional Strength of Ships)," based on scientific researches which have, after exhaustive laboratory tests of steel ship models built for the purpose, resulted in establishing a complete theory for calculations of vessels' strengths, relating to torsional stresses, which no doubt will be of great universal interest and assistance to shipbuilders and naval architects, and beneficial to shipowners.

REAR ADMIRAL LOUIS R. DE STEIGUER became commandant of the Boston Navy Yard on June 14, succeeding Rear Admiral Henry A. Wiley, assigned to command a division of the battle fleet of the navy with the rank of vice admiral.

CAPTAIN HERBERT HARTLEY, commander of the *Leviathan*, was born in Oswego Falls, N. Y., 1875, and began his seafaring career as a cadet on the frigate *Saratoga*, loaned by



Captain Herbert Hartley

the United States Navy to the State of Pennsylvania as a training ship. During his two years' service aboard the *Saratoga*, Cadet Hartley was instructed in seamanship by two young officers then rating as ensigns, but who since have won international fame as naval officers. These two men were Admiral William S. Sims and Captain William H. Fletcher. In 1895 Commander Hartley entered the service of the American Line as a cadet and continued steadfastly with that line until his recent appointment as commander of the *Leviathan*. The greater part of Captain Hartley's career was spent on board the *S. S. St. Louis*. During the World War this vessel, renamed the *Louisville*, was active in transport service and was the first armed American merchant ship to cross the German submarine zone. During the war Captain Hartley earned for himself many honors, including the Navy Cross for his exceptional devotion to duty and bravery. After the war Captain Hartley commanded various vessels flying the American flag until he received the appointment as commander of the *Leviathan*.

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

Specifications Out for Clyde Ships

BIDS on approximately \$4,000,000 worth of work, involving the construction of two new passenger and freight ships for the Clyde Line are expected to be opened early in July, according to latest reports. Plans and specifications for the construction of two large vessels and providing for an alternate proposition covering two smaller vessels have been issued by Theodore E. Ferris, naval architect, and a decision on this contract is looked for next month.

It is understood that the larger type vessel will have a length of about 410 feet between perpendiculars, 55 feet beam, 32 feet 9 inches depth to hurricane deck with a load draft of about 18 feet. The ships will be driven by turbine engines, steam being supplied by 4 Scotch boilers burning oil for fuel. They will probably be required to develop a speed of 15 knots.

Navy to Seek 15 New Vessels From Incoming Congress

IT has been learned that at the coming session of Congress the Navy Department will present a building program of eight cruisers, four river gunboats and three cruiser submarines, to the Budget Bureau and Congress.

The General Board has been instructed to consider plans which will give the navy the most efficient vessel of the cruiser type within the limitation of the Four Power Naval Treaty, since that treaty limits cruiser tonnage to 10,000, according to Secretary Denby. The eight new ships will probably follow closely the design of the Detroit class, now in progress of delivery.

The four gunboats will be for the Chinese river patrol as a recent inspection of the old vessels now engaged in that patrol indicated that they must be replaced as quickly as possible. In this connection, Secretary Denby said: "In view of the situation in China and the vast amount of trade at stake, the department feels it is most imperative that small modern gunboats be immediately authorized by Congress."

Tug and Lighter Planned

THE Southern Pacific Company, Pier 49, North River, is planning the construction of a steel harbor tug and a wood or steel harbor steam lighter. The tug will have a length of about 95 feet and it will be equipped with a compound condensing oil

American Marine Congress Called for November 5-10 to Be Greatest United Move for Merchant Marine

THE Board of Directors of the American Marine Association has authorized the calling and holding of an American Marine Congress, during Marine Week, November 5-10, 1923, in New York City. It will be called by the American Marine Association in collaboration with the United States Department of Commerce, and other government departments and a great number of marine and allied organizations, including manufacturers, commercial, export, trade, transportation, farm, and labor groups.

POLICIES

The policy of this Congress will be one of self-defense for American shipping, and will function along the following lines:

(1) To urge, sponsor and recommend the modification or repeal of statutory restrictions or laws which tend to burden the world-wide competing capacity of American ships, but at the same time to maintaining or establishing all necessary restrictions as pertain to the safety of passengers and crews, protection of goods, and protection of rights, quarters and living standards of American crews.

burning engine, while the lighter will be about 112 feet in length and also equipped with an oil burning engine. Plans and specifications are expected to be issued to bidders in about a week or ten days.

Western Farmers and Manufacturers Conferred June 28-29

INVITATIONS were accepted by the American Steamship Owners Association, the Shipping Board, the Council of American Shipbuilders, the United States Ship Operators Association, the National Merchant Marine Association, and the Foreign Trade Council to attend a meeting of the Middle West Farmers-Manufacturers Conference held in Gibson Hotel, Cincinnati, June 28 and 29. This gathering, which is a very encouraging sign because of an awakening interest in marine affairs by farmers and others in the interior, had for its purpose the discussion of a means for stimulating foreign trade by the use of American flag ships.

The conference believes in the establishment of a powerful national merchant marine without subsidy, and representatives of the various shipping groups, as well as Senators from twenty middle Western states and twelve Atlantic and Gulf coast states had been asked to be prepared with suggestions for a plan looking to this end which can be formulated into a bill for presentation to Congress.

(2) To recommend the adoption of such new legislation as will increase the world wide competitive capacity of American ships.

(3) To recommend and urge such necessary modifications and changes in the steamship code as may be advantageous.

(4) To develop and recommend such aid as will permit of an advantage in favor of building and repairing in American shipyards, with American labor, and materials.

(5) To recommend such standardization of construction and operation as will tend to reduce operating costs and increase competitive capacity.

(6) To recommend and urge the repeal of such legislation as permits of government agencies (such as navy yards) competing with private enterprises (such as private ship yards).

(7) To consider and make recommendations concerning government owned ships or lines competing with private ownership.

(8) To consider the advantages of reciprocal agreements with foreign lines on both outgoing and incoming shipments.

The Honorable Herbert Hoover, Secretary of Commerce, expressed the belief that this was the best effort he had yet heard of in the marine field, and that he would assist and co-operate to the utmost, and that the entire services of his department were at the association's disposal.

ORGANIZATION

The organization of the American Marine Congress will be as follows:

Administrative Committee

The working organization, in which is vested the authority to negotiate, arrange, direct and execute all plans, or in other words the machinery of the Congress:

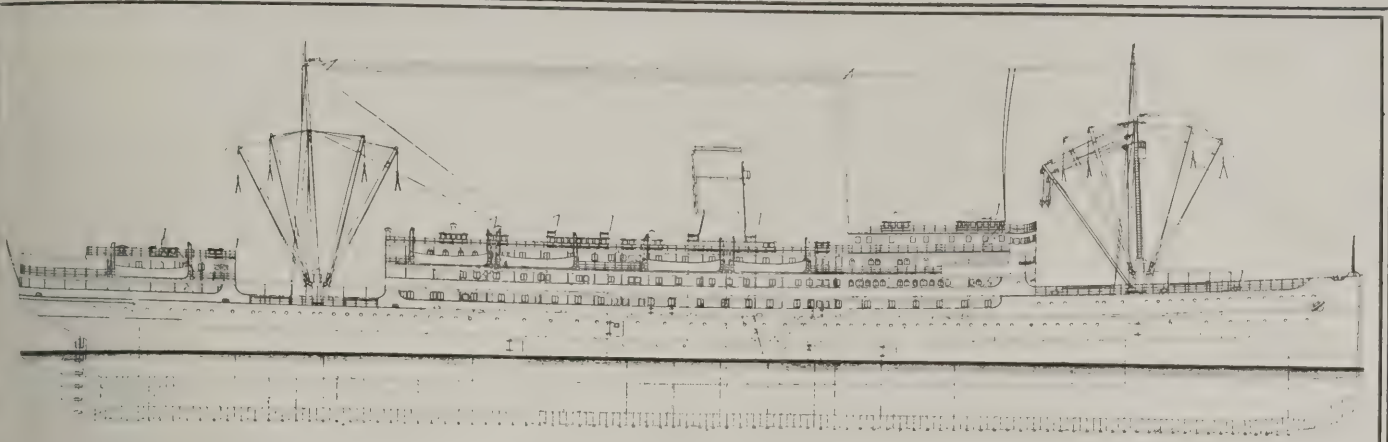
Walter M. McFarland, Chairman;
Frank J. Shipman, Vice Chairman; K. Warren Heinrich, Secretary; Charles F. Scott, James Plummer, Edward A. Colson, Frank W. Sterling, Fred B. Webster. All representing American Marine Association.

All communications should be addressed to the Secretary, who will route them to the proper party for action.

Central Committee

This committee will determine policies subject discussions, sectional meetings, speakers, papers, etc., and is to work in close co-operation with the Administrative Committee. The President of the American Marine Association to always be Chairman of this Committee.

The personnel of this Committee is not yet complete, but present plans contemplate



Outboard Profile of Passenger Steamers Proposed for California-Australia Service

that the President, or an officer of each of the following organizations will comprise the Committee: American Marine Association, American Steamship Owners Association, Secretary of Commerce, U. S. Ship Operators Association, Maritime Association of the Port of New York, New York Tow Boat Exchange, Atlantic Coast Shipbuilders Association, Council of American Shipbuilders, Society of Naval Architects & Marine Engineers, American Bureau of Shipping, National Marine Engineers Beneficial Association, Masters, Mates & Pilots, U. S. Chamber of Commerce, National Foreign Trade Council, South Atlantic States Association, American Manufacturers Export Association, National Association of Manufacturers and (Proper Farmers Organization).

GENERAL COMMITTEE

This committee will be honorary, but from which various committees will be drawn. It will have no special duties and is to be composed of officers and Executive Committee members of American Marine Association, government officials of all departments, officers of all associations co-operating, and all other prominent individuals whose activities warrant their appointment on this committee.

Sectional Committees, whose function it will be to assist the Administrative and General Committees in anything they possibly can in their own districts will be formed at once for the following:

- (1) New England District.
- (2) Port of Greater New York, Hudson and inland waterways.
- (3) Delaware River District.
- (4) Hampton Roads—Baltimore to Norfolk.
- (5) South Atlantic States and Gulf.
- (6) Mid-West States and Mississippi River District.
- (7) Great Lakes District.
- (8) Pacific Coast.

BENEFIT TO INDUSTRY

Throughout the entire industry, from the companies who manufacture those things which go into ships to the groups who furnish the cargoes, there is a great need for UNITY OF PURPOSE, and a wonderful opportunity for CO-ORDINATION OF EFFORT, to the end that a definite shipping program may be produced.

It is reasonable and logical to assume that such a program can be carried out successfully, a marked improvement in the industry will result. The benefit derived from this Congress, either to the industry as a whole or to individual companies in it, is proportional to what they put into it.

Contract for \$5,000,000 in New Ships for Oceanic Steamship Company Awaits Favorable Action By Shipping Board

THE placing of contracts for approximately \$5,000,000 worth of new business, involving the construction of two passenger ships and their attendant equipment, may hinge on the action of Edward P. Farley, recently appointed as head of the Shipping Board to take office on June 12, according to information received by MARINE ENGINEERING AND SHIPPING AGE from Washington. The proposed ships have been designed for the Oceanic Steamship Company, of San Francisco, Cal., for the California-Australian service.

The company desires a ten-year mail con-

tract with the government and immediately on accession to its requests is ready to issue plans and specifications to American shipyards for the new steamers. Frederick S. Samuels, general manager of the Oceanic Company and assistant to its president, was in Washington recently and laid the proposition before the Postal and Shipping Board authorities. According to reliable information, Mr. Samuels set forth the facts that the ships would be 500 feet in length, driven by turbo-electric machinery and modernly fitted throughout. They would be built entirely of steel.

Assistant Secretary of the Navy Roosevelt has approved participation of the Navy in the forthcoming Congress and is taking steps to have National Navy Day for all parts of the country fall during the week of the Congress.

Admiral Benson has also given the move-

ment his hearty endorsement and co-operation, which latter is expected to be of special import to manufacturers and operators of Diesel engines, and Admiral Moffat, Chief of the Naval Air Service, will also take an active part, with an especial bearing on the delivery of mail to ships at sea.



Propeller Club of the Port of New York in Session, Whitehall Building, New York City, June 8, 1923.

At this meeting 150 members and guests listened to addresses by Colonel E. A. Simmons, President, American Marine Association; E. J. McCormack, of Moore & McCormack, and Matthew Hale, President of the South Atlantic Maritime Corporation.

Forty-five Boats to Be Constructed for Canal Service

THE construction of five steel power barges and forty steel tow barges from plans and specifications prepared by Kindlund & Drake, naval architects and marine engineers, of 17 Battery Place, New York, is expected to be started in the near future. The boats are to be built for the Interstate Vessel Owners, Inc., of Buffalo, N. Y., for the carrying of bulk cargoes through the state barge canal between Buffalo and New York City. The contract will be one of the largest of its kind ever brought out and the vessels will embody many new features developed by the architects.

Each of the boats will be approximately 100 feet by 21 feet 6 inches by 13 feet; the towing barges to be equipped with internal combustion engines, each developing 375 brake horsepower.

10-Carfloat Order Awarded New York Shipbuilding Corp.

AN order, said to be one of the largest of its kind given since the war, has been placed with the New York Shipbuilding Corporation, of Camden, N. J., by the Pennsylvania Railroad, for ten steel car floats, to cost approximately \$700,000.

This contract will place at the service of the rail line a fleet of modern barges each 350 feet long by 34 feet wide and nine feet in depth, for use in New York harbor. They are to have double tracks for freight cars, the center protected by a steel shed structure to permit handling of freight in all kinds of weather. Ten months is the contract time for completion but the work will be started very shortly and will be rushed to completion.

Newport News Yard Low Bidder for Steel Standard Oil Barge

THE Newport News Shipbuilding Company submitted the lowest bid for the construction of a steel self-propelled oil barge proposed for the Standard Oil Company of New Jersey, at the opening of tenders at 26 Broadway, on May 28. The vessel is to have a length of 220 feet, beam 38 feet, having a capacity of approximately 11,000 barrels of oil. Seven shipyards submitted quotations covering a variety of types of equipment.

Bids Received at Florence, Ala., for New River Towboat

THE United States Engineer Office, at Florence, Ala., received bids on June 11 for the construction of a steam driven stern wheel towboat, as follows: Charles Ward Engineering Works, \$204,000 and Dravo Contracting Company, \$208,000, with an alternative proposition, using stock engine, of \$192,400. Award has not yet been made.

Bids Open July 16 at U. S. Engineer Office, Nashville, Tenn., for Construction of 136-Foot, Steel, Stern Wheel Towboat

THE United States Engineer Office, at Nashville, Tenn., will receive sealed proposals until 11 A. M., on July 16, for the construction of a 116-foot steel hull stern wheel towboat to be delivered at Paducah, Ky. The proposed vessel is to have a length overall of 136 feet 7½ inches, length molded 116 feet, breadth molded 29 feet, mean draft 3 feet 7 inches and is to be built to the American Bureau of Shipping rules. The longitudinal system of framing will be used and the boat will be steered by two rudders.

BOILERS

The main boiler is to be of the marine watertube cross-drum type, with a heating surface of approximately 2,000 square feet and designed for a gauge pressure of 235 pounds per square inch and 150 degrees of superheat. It is to be fitted for burning coal.

PROPELLING ENGINES

The propelling engines are to be of the surface condensing tandem compound type,

Ellicott Machine Corporation Is Low Bidder for Dredge

THE Ellicott Machine Corporation, 1111 Bush Street, Baltimore, Md., with a price of \$288,730, submitted the lowest tender for the construction of the steel hull 6-cubic yard grapple dredge *Wissahickon* when bids were opened by the Department of Wharves, Docks & Ferries of the City of Philadelphia, on May 31.

City of Norfolk Bids \$4,000,000 for Government Supply Base, Including Two Piers, Warehouses and Equipment

NORFOLK, Va. (Special).—The City of Norfolk was the only bidder when bids on the Norfolk Army Supply Base were opened at the War Department on May 22. Four proposals were submitted by the city through City Manager Charles E. Ashburner and Port Director Arthur G. King.

The city submitted a bid of \$4,000,000 for the entire property and offered \$3,950,000 for the property exclusive of the "Barrett tract," on which stands the residence of the commanding officer of the base. A bid of \$3,975,000 was entered for the property with the delayed delivery of certain portions, including a tract of six acres of land and one warehouse the government proposes to reserve for five years for the storage of certain war materials.

A bid of \$5,000,000 was submitted for the whole property, including cranes, locomotives, repair parts, cars and fire apparatus owned by the government, stipulating that payments for the property should be carried over a period of thirty years with interest at 4 per cent, but the interest not to begin until January 1, 1926. This bid specified that the government keep the property in repair until that time.

The War Department has reserved de-

cision on the sale of the property for two days. They are to be designed for a working pressure of 250 pounds per square inch, 150 degrees of superheat at the boiler and a vacuum of 26 inches, the cylinders to be 10½ inches and 18 inches in diameter, respectively, with a common stroke of 72 inches. The condenser is to be cylindrical in shape, two passes with a cooling surface of 800 square feet measured on the outside of the tubes.

The paddle wheel is to be of the radiating fixed paddle type, 16 feet in diameter over buckets, with thirteen buckets 24 inches wide by 18 feet long.

Vacancies for Draftsmen

The United States Civil Service Commission, Washington, D. C., announces the following competitive examinations:

Ship Draftsman. Receipt of application will close July 24, examination to fill vacancy in the Coast and Geodetic Survey, entrance salary of \$130 a month, plus increase of \$20 a month, and vacancies in position requiring similar qualifications.

Design Draftsman (Structural). Applications will be rated as received until August 31, to fill two vacancies at the Naval Operating Base, Pearl Harbor, Hawaii, one at an entrance salary of \$6.80 a day, and the other at an entrance salary of \$8.80 a day, and vacancies in similar positions.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. Civil Service Examiners at the Post Office Customhouse in any city.

For several weeks the general impression has prevailed that the city would have opposition in bidding for the purchase of the Army Base. The specifications issued by the War Department require that the purchaser pay for the property in twenty-five years, and the city's proposals, with the exception of the \$5,000,000, provided for payment within this time at 5 percent interest.

The property consists of approximately 639 acres of land. There are two covered concrete and steel piers, over 1,300 feet in length, eleven warehouses, 2,079,000 square feet of open storage, fifty miles of track, railroad yards and a score of miscellaneous buildings and other appurtenances.

The Army Base cost about \$23,000,000 built during the war, and the Government estimate of replacement value is in the neighborhood of \$16,000,000. The city's estimate, however, is somewhat below this figure.

The city is ready to finance the purchase of the property. The Port Commission does not feel that the city would be justified in paying a greater price for the property because there would be some doubt as to the ability to pay its own way for the present

Webb Institute of
Naval Architecture
Holds Commencement

THE twenty-seventh annual graduating exercises of the class in naval architecture and marine engineering of the Webb Institute was held in the assembly hall of the college at University Heights, New York, on Thursday, June 7. Commander Stevenson Taylor delivered the opening address in which he compared the present time to that at the end of the Civil War. "There was apprehension then as there is now and in your particular work, although shipbuilding is at a low tide, there is bound to be a turn." The education received at Webb Institute, he pointed out, has been put to good advantage in other lines than shipbuilding by former graduates. It would probably be necessary, he said, for some of this year's class to enter other occupations at least temporarily. It is the usual thing at commencement exercises, Mr. Lewis Nixon declared, to advise the graduates not to make the mistakes that we were advised not to make but to avoid. It is very unusual on the other hand that a class of men entering the profession of shipbuilding is given such splendid encouragement as was furnished by Mr. Winthrop L. Marvin, vice president and general manager of the American Steamship Owners' Association.

OUR SHIPPING TRADITION

We should like to print his address in full but have felt it essential to devote a large part of our space this month to the *U.S.S. United States* which places America again in the enviable position, after a great many years, of owning the largest, the safest and the swiftest ocean liner in the world. These graduates enjoy the remarkable coincidence of the fact that they start their active work at the same time as this vessel begins her career as a passenger liner under the American flag. Shipping has been nationally neglected for a long time and many there are who have come to believe that we can never make good on the sea. If the facts set forth by Mr. Marvin could be broadcasted over the land, this belief would be dispelled once and for all. Some of them are as follows: "Shipbuilding was the very first form of ambitious and successful mechanical effort pursued by the pioneers of our race in the new World. "For years shipbuilding was the most attractive trade which coast-born lads could turn. "Though the British Cunard Company was the oldest on the Atlantic, it did not build its first iron hull until 1855, and it did not launch its first screw steamship until 1862. "Some of the stout iron screw steamers built in American yards 50 years ago are still afloat, so excellent were their materials and workmanship. "The *Ohio*, *Indiana*, *Illinois* and *Pennsylvania*, built by Cramps' shipyard in 1872 and 1873 broke the record for speed then held by the *City of Brussels*.

OUR GREATEST ACHIEVEMENT

"This hasty review brings us down to the present time—to the stupendous achievement of emergency ship construction of 1,400 steel liners—the most remarkable mechanical undertaking the world has ever seen—because in many instances the yards had to be converted to build the ships. "A nation whose naval architects, engineers and builders were unprogressive could never have performed this exploit."



S. S. United States, Reconditioned for Passenger Service on the Great Lakes

S. S. United States
Refitted for Lakes
Passenger Service

REFITTED as a passenger steamer for service on the Great Lakes, the *United States* recently left the Tebo plant of the Todd Shipyards Corporation with forty passengers. She is probably the first vessel

Company. She has been refitted by the Todd Shipyards Corporation from designs prepared by Henry J. Giesow, naval architect, new staterooms, accommodating about 100 passengers, having been added. Considerable deck space has been provided and four dining rooms arranged in the forward part of the vessel.

ORIGINAL SERVICE

Originally built by the Manitowoc Shipbuilding Company, of Manitowoc, Wis., in 1909, to carry passengers between Milwaukee and Grand Haven, the *United States* was elaborately fitted with forty-six staterooms, each named after a state in the Union. The large public rooms were decorated with a series of historical paintings depicting stirring episodes in the nation's history. After six years the vessel was purchased from the Crosby Navigation Company by Col. E. H. R. Green for about \$500,000. The contract for rebuilding the vessel according to the new owner's plans was awarded to the Robins plant of the Todd Shipyards Corporation.

HULL LENGTHENED

About forty feet were added to the hull amidships and the entire interior of the vessel rebuilt. Col. Green desired to retain all home comforts in the new designs and consequently many nautical features were done away with. All overhead beams were concealed and the new rooms laid out on a much larger scale and furnished with remarkable examples of very elaborate period furniture. The living room on the main deck was very spacious, being 26 by 28 feet in size and containing an enormous open fireplace in the after end. The gymnasium was also located on this deck, with suites of Turkish, vapor and shower baths adjoining.



Typical Stateroom

to carry passengers from New York to ports on the Great Lakes. As the steam yacht *United States*, owned by Col. E. H. R. Green, son of the late Hetty Green, this vessel was the largest and one of the most palatial steam yachts in the world. She is 256 feet in length, 41 feet in beam and 16 feet in depth. For the last few years she has been berthed at the Tebo Yacht Basin in Brooklyn. Several months ago she was purchased by the Peninsular and Northern Navigation



Dining Room



Lounge

Foreign Shipping and Shipbuilding Activities



New French Line Passenger Steamship Cuba

New French Turbine Liner Cuba to Go on St. Nazaire-Havana-Vera-Cruz Route

PARIS, France (Special).—The Compagnie Generale Transatlantique (French Line) has taken delivery of the new passenger vessel *Cuba* built by Messrs. Swan, Hunter and Wigham Richardson at Newcastle-on-Tyne. This twin-screw liner is 476 feet long, 59 feet 9 inches beam, 39 feet 4 inches deep; her deadweight is 6,375 tons on 24 feet 7 inches draft. Her approximate gross tonnage is 8,850 tons.

The propelling machinery consists of two sets of Rateau steam turbines driving the propeller shafts through double reduction gearing. Owing to the inconveniences experienced in service with several vessels equipped with ordinary double reduction gearing in the course of the last year, the owners decided that in lieu of Parsons gearing, as was originally designed, Westinghouse gearing with floating frame should be fitted, and the *Cuba* is the first vessel equipped with this design of gearing in this country.

Quill shaft drives have thus been adopted between turbines and first reduction pinions as well as between first reduction wheels and second reduction pinions. The nickel steel pinions were manufactured by Messrs. Armstrong, Whitworth and Company. The power developed is 6,500 horsepower normal and 9,000 horsepower maximum.

Steam is supplied by eight boilers. The oil burning plant was supplied by the Wallsend Slipway Engineering Company. The boilers are capable of being rapidly converted to coal burning if necessary. Arrangements have been made for the ship to bunker at Havana where in spite of the rate of exchange the cost of oil fuel is considerably lower than the prices current in French ports.

The *Cuba* has been built to the highest class of the Bureau Veritas, the French ship classification society. She has been designed to comply with the regulations on safety at sea laid down at the 1914 International London Conference although these new reg-

ulations have not so far been definitely ratified by French Parliament and are not yet enforceable.

Passenger accommodations are provided for 8 de luxe, 273 first class, 50 second class, 76 third class passengers, 176 cabin emigrants and 504 emigrants in posts. The total of the passengers thus works out to 1087.

The decoration of the *Cuba* has received special attention from the owners and she will rank among the finest modern passenger vessels in this country. The decorative work has been carried out by three well-known French firms of ship decorators (Billard et Rousseau, Leglas Maurice et Jamin, and Marc Simon). The leading feature of the decoration of this vessel is an example of the French modern art, and this explains why reproductions of several pieces of furniture and decorative work of this steamer have been shown at several important art exhibitions in Paris.

The *Cuba* ran her speed trials on April 12: a maximum speed of 17 knots was attained and the service speed of the ship is expected to be about 15.75 knots.

The *Cuba* is to run on the Saint-Nazaire, Coruna, Havana, Vera-Cruz route, together with the two other liners *Espagne* and *Flandre*. She sailed on her maiden trip on May 5.

Turbine Blades of Monel Metal

LONDON, England (Special).—At the recent conference at Sheffield on the subject of corrosion, a number of the industrial uses of monel metal were discussed. In regard to turbine blading, it was suggested that any troubles experienced with monel metal were not due to any inherent inability of the metal to withstand the stresses to which it is subjected. If the preparation of the alloy and the heat treatment is right, it was asserted that users could rely that metal specially prepared for turbine blades would have a tensile strength of 40 tons per square inch and an elongation of 26 percent. Moreover they would have the additional advantage that at temperatures as high as 750 degrees Fahrenheit the metal would not suf-

fer to any appreciable extent in tensile strength and modulus of elasticity.

A Five-Bladed Propeller

LONDON, England (Special).—It has been recently learned that a five-bladed screw propeller has been manufactured by Bull's Metal and Melloid Company, Yorker, England, to the order and specification of a Continental firm of engineers. It is not known for what purpose this propeller has been made but it is a solid wheel 18 feet 5 inches in diameter and it weighs 9 tons 15 hundredweight. The propeller has been made from the firm's special metal.

Single Reduction Geared Turbines for S. S. De Grasse

PARIS, France (Special).—I reported in my article which appeared in the May issue of MARINE ENGINEERING AND SHIPPING AGE that the French Line were considering the adoption of turbo-electric drive for their passenger vessel *De Grasse* which is under construction at the yards of Messrs. Cammell, Laird, at Birkenhead, and will be placed in service on the Havre-New York line.

This scheme has now been definitely rejected by the owners for several reasons: the chief reason lies in the fact that France has had so little experience with the electric drive, there being only two French vessels so equipped. Second: Very few French marine engineers are acquainted with this mode of ship propulsion and it would be necessary to provide special training for them. Third: The French Line considered it not advisable to make a first experiment of this mode of propulsion on a vessel placed into service on the mail line between Havre and New York.

It is thus likely that the adoption of turbo-electric drive will be reserved for vessels engaged in services which do not involve so much reliability in the running of vessels

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Steamer Drydocked, Chester, Pa.—The steamship *io* has been drydocked at the Sun Shipyard, Chester, for miscellaneous repairs.

Ferryboat Docked, Portsmouth, Va.—The ferryboat *Porpoise* has been docked at the Portsmouth Navy Yard for necessary repairs.

Overhauling, Toledo, Ohio.—The steamer *H. S. Wilkinson*, damaged in collision in the Great Lakes, has been taken to Toledo for extensive repairs.

Tug Overhauling, Portland, Ore.—The *F. A. Douty* has been drydocked to have a new wheel fitted and undergo annual inspection.

Steamer Repairs, Ashtabula, O.—The steamer *May*, with about six damaged plates, has been docked for repairs at the Ashtabula yard.

Steamer Repairs, Detroit, Mich.—The steamer *Conneaut*, which lost her shoe and rudder recently, has been drydocked at Detroit for repairs.

Tanker Drydocked, Chester, Pa.—The American tanker *Sun*, owned by the Sun Oil Company, has been drydocked at the Sun Shipbuilding Company, Chester.

Repairs, Portland, Ore.—The crippled schooner *Red Baxter* was towed to Portland recently to be drydocked. She lost her propeller on her way up the coast.

Freighter Drydocked, Chester, Pa.—The Furness-Reserve freighter *Portuguese Prince* has been drydocked at the Sun Shipbuilding & Drydock Company for repairs.

Installation of Stern Frame, San Francisco, Calif.—The Norwegian motorship *Handicap* has been moved on the Bethlehem ways to have a new stern frame installed.

General Overhauling, Buffalo, N. Y.—The passenger steamship *Tionesta* is in the Buffalo Drydock where her bottom painted and a general inspection and overhauling.

Overhauling at Navy Yard, Philadelphia, Pa.—The Pennsylvania State schoolship *Annapolis* will undergo annual overhauling at the Philadelphia Navy Yard.

Damage Repairs, Portland, Ore.—The steamer *Malta Mahony* has been lifted for repairs due to damage caused when she upset recently with too heavy a deck load.

Bids Requested, Philadelphia, Pa.—The Reading and Iron Company is asking bids for the barge *Alata*, now lying on the Maine coast, to be sold and where it is.

Steamer Drydocked, Superior, Wis.—The steamer *Island*, which hit the crib at the entrance to Neeshier Cut, has been placed in drydock at the Superior for repairs.

Turbine Gear Repairs, Philadelphia, Pa.—The contract for repairing the turbine gears of the Italian steamship *Tuscola* has been awarded to the John A. Leary Iron Works, Philadelphia.

General Overhauling, San Francisco, Cal.—The steamship *Agnes Dollar* was taken to the General Engineering yards for drydocking, general overhauling, and to have her tailshaft drawn.

Steamer Drydocked, Chester, Pa.—The British steamship *Tartar Prince* has been drydocked at the yards of the Sun Shipbuilding and Drydock Company, Chester, for painting and inspection.

Coast Guard Cutter Repairs, Oakland, Cal.—The United States Shipbuilding Company submitted the lowest estimate for repairs on the United States coast guard cutter *Cahokia*, with a price of \$1,178.

New Boilers, Portland, Ore.—The Commercial Iron Works received the contract for the removal of Scotch marine boilers aboard the government dredge *Clatsop* and will install new pipe boilers.

Fireboat Repairs, Jacksonville, Fla.—The city fireboat *John B. Callahan* has been hauled out on the Merrill-Stevens drydock for slight repairs, the Merrill-Stevens Company having submitted the lowest bid.

Steel Ship Launched, Chicago, Ill.—The new freighter *Herbert N. Heath*, of 120 tons, has been launched. She is of steel construction and steam power, is 65 feet long, 22 feet wide, and draws eight feet.

Tug Drydocked, Portland, Ore.—The tug *George H. Mendell* was recently placed on the Portland drydock to ship a new propeller and also to have her stern bearing inspected, cleaning and repainting of the hull.

Lighter Launched, Baltimore, Md.—Booz Brothers recently launched the second of an order for two harbor lighters for the Cottman Company, the dimensions being 80 feet long, 24-foot beam, and 7 feet 6 inches deep.

Repairs Completed, Canal Zone.—The tanker steamer *Miskianza* left the Canal Zone early last month after the completion of repairs amounting to about \$13,000. The ship is being operated by Walker & Daly, New York.

Steamer Repairs, San Francisco, Cal.—At the opening of bids for the repairing of the steamer *West Chochea*, operated by Struthers & Barry, the Crowley Shipbuilding Company, of San Francisco, Cal., was low bidder with a tender of \$1,470.

Low Bidder, San Francisco, Cal.—With a price of \$835 Smith & Scanlon was low bidder for voyage repairs on the Pacific Mail intercoastal carrier *Ecuador*. Other bids were: United Engineering, \$945; Bethlehem, \$1,025; Moore's, \$1,098, and Crowley's, \$1,250.

Contracts Awarded, Mobile, Ala.—The Alabama Drydock & Shipbuilding Company was awarded the following contracts: steamship *Hulaco*, for inspection, painting, drydocking and overhauling; and the bay steamer *Crescent City*, for cleaning and painting bottom.

Low Bidder, Oakland, Cal.—At the opening of tenders for voyage repairs to the Swayne and Hoyt government-operated freighter *West Jappa*, the Hanlon Shipyard submitted the lowest bid. The prices were: Hanlon's, \$2,688; Moore's, \$2,738, and Bethlehem, \$2,775.

Overhauling and Repairs, Buffalo, N. Y.—The Oldman-Magee Boiler Works has transformed the steamer *Usono*, belonging to White-Gratwick & Mitchell from a trunk-hatch type into a five-hatch type, giving her at the same time a general overhauling and repairs.

Tug Overhauling, Staten Island, N. Y.—The tug *Howard C. Moore*, of John E. Moore Company, is undergoing a general overhauling at the Staten Island Shipbuilding Company's Port Richmond yard. Foster waste heat type superheaters for 75 degrees superheat will be installed.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation received the following contracts: Matson steamer *Mau* and the American-Hawaiian steamer *Ohioan*, for cleaning, painting and drydocking; the *Idaho*, *Water Nymph*, *Pennsylvanian* and tug *Payson*, for miscellaneous repairs and painting.

Diesel Dredge Launched, Portland, Ore.—The Portland Shipbuilding Company recently launched the first Diesel electric dredge yet floated in waters of the United States, so far as records are known to the Long-Bell Lumber Company. The dredge is the *Texas*, a wooden-hull type.

Bids on Windlass, Staten Island, N. Y.—Sealed proposals were received by the Superintendent of

Lighthouses, 3rd District, Staten Island, N. Y., on June 11, for one steam capstan windlass, to be delivered at tidewater at Key West, Fla., accessible to the tackle of a lighthouse tender.

Estimate on Engines, Portsmouth, Va.—The Bureau of Engineering has designed a new type of gasoline engine, a detailed description of which has been furnished the navy yard with the request that the yard submit detailed estimates as to time and cost for manufacture of fifty of them.

New Ferryboat Planned, San Francisco, Cal.—The officials of the Northwestern Pacific are reported as planning to build a ferryboat, to be 280 feet long and 72 feet beam, and of the latest type. Several shipyards are now engaged in drawing plans for submission to the Northwestern Pacific Company.

Miscellaneous Repairs, Buffalo, N. Y.—The Ashtabula & Buffalo Dock Company has finished installing a new tank top in the steamer *Venus* and has placed new furnaces and made other repairs on the steamers *Tarus*, *Hemlock* and *Conopus*, all belonging to the Interlakes Steamship Corporation.

Steamers Drydocked, Great Lakes.—After having grounded near Bailey harbor, the steamer *Alex B. Uhring* was placed in drydock at Milwaukee with twenty-nine damaged plates, five of which will be renewed. Steamer *Back Bay*, formerly the *Burlington*, has been docked at Cleveland for repairs to bottom damage.

Miscellaneous Repairs, Chester, Pa.—The Atlantic Refining Company's tanker *J. E. O'Neill* has been drydocked at the Sun Shipbuilding and Dry Dock Company for miscellaneous repairs. The Merchants' and Miners' Transportation Company's passenger steamship *Ontario* has also been drydocked at the same company's yards.

Steamship Conversion, Brooklyn, N. Y.—The *Montpelier*, one of the steamers operated by the United American Lines, has been taken to the Crane Drydocks, Brooklyn, for reconditioning as an oil-burning ship, after which she will be placed in the recently established service between Pacific coast ports and Europe.

Contract Awarded, San Francisco, Cal.—The General Engineering and Dry Dock Company received the contract for voyage repairs to the Pacific Mail liner *President Wilson*, at a price of \$4,018. The other bids received were: United Engineering, \$5,177; Crowley's, \$5,342; Moore's, \$5,400, and the Bethlehem Shipbuilding Corporation, \$5,596.

Scout Cruiser Passes Trial, Puget Sound.—The second cruiser to leave the Tacoma plant of the Todd Shipyards Corporation, the United States scout cruiser *Milwaukee*, recently passed a successful trial trip, making a speed of 35 knots or 40.3 statute miles per hour. During the trial the *Milwaukee*'s engines developed 97,000 shaft horsepower.

Contracts Awarded, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company has been awarded the following contracts: Steamship *Edgefield*, chipping, scaling, painting, tail shaft examination and other miscellaneous repairs; tug *Buzzard*, drydocking and installing new propeller; tug *Nimrod*, boiler repairs, and United Fruit Company's steamship *Venator*, repairs.

Shipyard Activities, Oakland, Cal.—The Moore Drydock Company has been awarded the following work: Installing of a new tailshaft on the steamer *Dewey* and various repairs on the transport *Dix*, ferryboat *Cazadero*, motorship *La Merced*, the latter being equipped with new masts and other general reconditioning preparatory to departing in the off-shore trade, and the schooner *Fox*.

Repair Contract, Kearny, N. J.—A contract for the drydocking and general repairs and the putting into condition of approximately thirty vessels of the Submarine Boat Corporation, operated by the Transmarine Corporation, in connection with the Port Newark development, has been awarded to the Federal Shipbuilding Company, of Kearny, N. J. It is

understood that the contract will involve over \$50,000 and the vessels are to be taken to the yard at the rate of one per week.

New Steamer, South Jacksonville, Fla.—George W. Gibbs, Jr., president of the Gibbs Gas Engine Company, has announced that the company has obtained the contract for the construction of a new steamer for the Virginia-Carolina Chemical Company, of Wilmington, N. C. The steamer will be 65 feet long, have two decks, and will be equipped for passenger and freight service. It will be used at Richmond, Va.

Shipyard Activities, Oakland, Cal.—The Coast Guard cutter Golden Gate is being repaired by the Hanlon Shipbuilding and Drydock Company, at a price of \$281. The yard was also low bidder on repairs to the West Prospect, operated for the Shipping Board by Struthers & Barry, the bid submitted being \$739. The lumber carrier Helen P. Drew and the pilot boat Gracie S. are at the Hanlon yard for general overhauling.

Ship Repair Contract, San Francisco, Cal.—The General Engineering and Dry Dock Company, San Francisco, Cal., received the contract for miscellaneous repairs on the Pacific Mail liner President Lincoln. The following tenders were received: General Engineering & Dry Dock Co., \$3,316; Moore Dry Dock Co., \$3,554; Bethlehem Shipbuilding Corp., \$3,810; Hanlon Dry Dock & Shipbuilding Co., \$3,857; United Engineering Co., \$3,945.

Extensive Repairs, Manitowoc, Wis.—The steamer Ann Arbor No. 4, which went to the bottom at the entrance to Frankfort harbor last February has been placed in drydock at Manitowoc. She has eighty-nine shelf plates and twenty-six deck plates damaged, her bottom being shoved up 10 inches from bilge to bilge for fifty feet. The steamer is to be at the shipyard for about five weeks and repairs will cost approximately \$100,000.

Repair Contracts, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was awarded the following repair work: Standard Oil tanker K. R. Kingsbury, overhauling; the Chiore, final adjustment preparatory to speed test; the La Purisima, general overhauling; tanker Levant Arrow, to have a new furnace installed in her boilers; the Mystic and freighter American, both of the American-Hawaiian fleet, for general repairs and cleaning.

Contracts Awarded, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation tendered the lowest bid for drydocking, cleaning, painting and general repairs to the army transport Meiggs, the following bids having been received: Bethlehem, \$3,925, and Moore Drydock Company, \$4,140. The Bethlehem Company was also low bidder for the general overhauling of the Associated Oil tanker W. S. Porter, with a bid of \$2,395, the Moore Company submitting a tender of \$2,424.

Ship Repairs, Kearny, N. J.—At the opening of tenders for the work of general repairs on the Montebello, the Bethlehem Shipbuilding Corporation was low bidder. The bids were: Bethlehem, \$11,803; Hanlon's, \$13,649; General Engineering, \$13,923; Moore's, \$14,651, and the Main Iron Works, \$15,699. On the Shipping Board steamer Bearport the bids were: Bethlehem, \$11,803; Hanlon's, \$13,649; General Engineering, \$13,923; Moore's, \$14,951, and the Main Iron Works, \$15,699.

Shipyard Activities, San Francisco, Cal.—The Crowley Shipyard was low bidder for carrying out miscellaneous repairs and cleaning of the Swayne & Hoyt Government operated steamer President Harrison and the quarantine tug Albatross. The bids submitted on the President Harrison were: Crowley's, \$175; General Engineering, \$211, and Bethlehem, \$250. The tenders on the Albatross were: Crowley's, \$635; General Engineering & Drydock Company, \$688, and William Cryer, \$702.

Construction Contract, Portland, Ore.—The contract for the construction of the hull for a new Snake river sternwheel steamer for the O. W. R. & N., of Portland, Ore., has been awarded to Supple & Martin. The new vessel, which is to replace the steamers Lewiston and Spokane, destroyed by fire last year, is to represent an outlay of about \$65,000 and will be 160.2 feet long, with a beam of 35 feet and depth of hold of six feet. Machinery saved from the burned steamers will go into the new vessel.

Radio Contract, San Francisco, Cal.—District Manager Linton of the United States Shipping Board in Seattle has advised A. Y. Tuel, manager of the San Francisco offices of the Federal Telegraph Company, that permission to install a Kolster radio compass and position finder on the Admiral-Ortalian liner President McKinley had been received and it is stated that if the installation proves suc-

cessful after a round trip to the Orient all of the 535-type vessels out of Seattle will be similarly equipped.

Shipyard Work, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, Mobile, has been working on the following contracts: Steamship Berterton, extensive turbine and condenser repairs, etc.; steamship Bayou Chico, stern tube rebushed, rivets renewed and other minor repairs; steamship Tauhate, minor work about boilers and deck winches; U. S. D. B. Boat L-58, renewal of bad planking, caulking all seams and renewal of entire copper sheathing on bottom and rolling chocks and rudder; and the steamship Quabbin, necessary repairs.

Vehicular Ferry, New York.—The Pennsylvania Railroad has placed in commission a ferryboat reconditioned to handle exclusively the vehicular traffic between New York City and Jersey City. The railroad has gradually converted its entire ferryboat fleet of eight boats into what is termed "double team gangway boats," on which the lower deck is reserved for vehicles and the upper deck for passengers. This reconditioning has doubled the vehicular carrying capacity so that sixty passenger automobiles can be accommodated on each trip across the river.

Yacht Refitted, Brooklyn, N. Y.—The steam yacht United States, owned by Col. E. H. R. Green, has been refitted as a passenger ship to carry passengers from New York to ports on the Great Lakes. The vessel is 256 feet long, 41 feet beam and 16 feet depth, and was one of the largest and most palatial steam yachts in the world. About forty feet have been added to the hull amidships and the entire interior of the vessel has been rebuilt. Several months ago she was purchased by the Peninsular & Northern Navigation Company. She has been refitted from designs prepared by Henry J. Gielow, naval architect, by the Todd Shipyards Corporation, new staterooms accommodating about 100 passengers, having been added.

Conversion Jobs Pending.—It has been learned that the O'Boyle Lighterage Company is figuring on taking the McIntosh & Seymour Diesel engine out of their wooden oil tanker J. F. Penrose, purchasing a Lake-type steel cargo boat from the Shipping Board and installing the engine therein. The Lake-type boats are of 3,500 deadweight tons capacity. The carrying out of this contract depends upon a satisfactory settlement with the Shipping Board with regard to price. Other reports in marine circles indicate that a large shipping company, whose stock is owned mainly by foreign interests, has definitely decided to convert several Shipping Board vessels to motorships, but so far has not been able to reach satisfactory agreement with the Shipping Board.

Extensive Repairs, Mobile, Ala.—The steamship Sapulpa, to be renamed the Cape Ann, has been placed on the docks of the Alabama Dry Dock & Shipbuilding Company. She was recently purchased by the Pure Oil Company. The work to be done on the vessel includes the following: Cleaning, painting bottom from keel to deep load line, examination of tail shaft, top sides scraped and painted, etc.; the inside work including testing out and repairing entire electric, telephone and fire alarm system and renewal of all defective fixtures, boilers cleaned, main and auxiliary condensers tested out, tubes cleaned and proven tight, refrigerating system thoroughly cleaned, charged and tested, ice machine thoroughly overhauled, and various other miscellaneous repairs.

New Fireboat, Los Angeles, Cal.—The Los Angeles Harbor Commission and Chief Ralph J. Scott are laying plans for added fire-fighting equipment at Los Angeles Harbor, both land and water apparatus. A new fireboat and engine company are to be located on the Wilmington waterfront, the center of the port's industrial growth. Chief Scott has also announced that fireboat No. 1, now stationed on the main channel at the harbor, will be remodelled. The gas engine, at present propelling the craft, will be replaced by a 300-horsepower full Diesel engine of the latest type, at a cost of approximately \$33,000. A tower will be constructed on the boat, so that the crew of the craft may be able to fight steamer and dock fires with maximum efficiency, the boat's two pressure heads being joined to a single line, operated from the top of the tower.

Floating Equipment, Wilmington, N. C.—The United States Engineer Office, Wilmington, N. C., received bids on June 4 for the construction of twenty-eight steel hulls to replace certain floating equipment now used by the Federal Government in local river and harbor improvements and mainte-

nance work. One of the vessels to be built for the Engineer Department is a new hull for the snag boat H. G. Wright, now used for removing obstacles from local waterways, two will be barges for conveying water and materials for dredges and other craft engaged in Government work on the river, and twenty-five will be catamarans for the suction dredge Henry Bacon, at work on the lower Cape Fear. The catamarans are to be small floats for supporting a large steel pipe through which mud and material pumped from the river channel by the dredge Bacon is conveyed to shallow water near the river bank. These floats are to replace worn-out catamarans of wood.

SHIPYARDS AND DRYDOCKS

Shipyard Purchased, Oakland, Cal.—David Blankenhorn, Los Angeles business man and member of the syndicate acquiring the industrial property, announced the purchase of the Liberty Shipbuilding Yards in Oakland, containing more than 170 acres. The title on the land was obtained from the Shipping Board by a group of Los Angeles and San Francisco financiers, including Mr. Blankenhorn, president of David Blankenhorn, Inc., investments; William F. Humphreys, attorney and president of the Old Mission Portland Cement Company in San Francisco; Henry Rosenfeld, executive of the Insurance Exchange and Firemen's Fund Insurance Company of the northern city, and James Tyson, president of a number of lumber concerns, including the Consolidated Lumber Company. During the war the yards were under the management of the Emergency Fleet Corporation, and many large sea-going vessels were constructed there. It is proposed to divide the yards into units and to sell them for industrial purposes to organizations who intend to locate in that section.

NEW INCORPORATIONS

The Nautilus Steamship Corporation of Manhattan has increased its capitalization from \$700,000 to \$800,000.

The Gaston, Williams & Wigmore Steamship Corporation, a Delaware corporation, has surrendered its authority at Albany.

The Lancaster Steamship Corporation of Manhattan, owning the steamer Lancaster, has increased its capitalization from \$300,000 to \$350,000.

Banks Rigging Company, of Brooklyn, ship riggers, capital \$10,000, chartered at Albany. Incorporators: T. M. Reid and E. M. Banks.

The International Salvage Corporation, of Brooklyn, incorporated under Delaware laws, has increased its capitalization from \$200,000 to \$500,000.

The General Marine Salvage Corporation, capital \$750,000, incorporated under Delaware laws. Corporation Trust Company, of America, registrars.

The New York, Atlantic City and Philadelphia Steamship Company, capital \$2,000,000, incorporated in New York. The beginning of this line will give Philadelphia two services to New York.

The Mexican, American Fruit & Steamship Corporation, capital \$12,000,000, organized under Delaware laws. Incorporators: F. J. Porter, Montgomery B. Angell and Otis T. Bradley, of New York.

PORT IMPROVEMENTS

Ferry Docks, Windsor, Ont.—Detroit & Windsor Ferry Company plans to extend and improve docks at Windsor, wood pile, concrete and timber. \$200,000.

Harbor Improvement, Olympia, Wash.—Thurston County voted on June 26 on improving harbor, including channel 35 feet deep, at low water, with turning basin, also tidelat and fill.

Dredging Bids Rejected, New York, N. Y.—Commissioner of Docks, Pier "A," North River, rejected bids for dredging between West 97th and West 99th streets. Contract 1799. Will re-advertise.

Levee, Stockton, Cal.—Western-Pacific Railroad, Mills Building, San Francisco, awarded the contract for a two-mile levee south of Stockton, 175,000 cubic yards, to W. A. Betchel, 625 Market street, San Francisco.

Sca Wall, Vicksburg, Miss.—Sealed proposals will be received until July 2, at City Hall, for a concrete wall along river front. Miller-Butterworth Company, 624 Southern Trust Building, Little Rock, Ark., engineers.

Rebuilding Dock, Superior, Wis.—Pepard & Fulton, 217 Board of Trade Building, was awarded the contract for rebuilding ore dock No. 2, here, by the Great Northern Railway, Railway Building, St. Paul, Minn.

Harbor Development, Los Angeles, Cal.—City voted \$15,000,000 bonds for development of harbor, including docks, wharves, warehouses, elevators, piers, railroad terminals, channels, breakwaters, jetties, dikes, etc.

Grain Elevator, Sarnia, Ont.—A grain elevator, steel and concrete, is planned on waterfront, here, by Hunt Brothers, Ltd., care of C. R. Hunt, Nightingale avenue, London, at \$1,500,000. Prices are wanted on material and equipment.

Pier, etc., Boston, Mass.—The City of Boston awarded the contract for rebuilding piers, bulkhead and dolphins for East Boston ferry, 100,000 feet more or less of piles and timber, to Rendle Stoddard Co., Main street, Chelsea. \$31,700.

Contract Awarded, Meridian, Cal.—The contract for making 141,313 foot ditch and lateral excavation, 18,000 foot main canal excavation, etc., was awarded to H. T. Reupke, Box 421, Los Banos, by Reclamation District 70. Price, \$33,222.

Piers and Wharf, Pearl Harbor, H. T.—Specification 4799. Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for reinforced-concrete concrete piers and wharf at Submarine Base, Pearl Harbor.

Ferry House, New Orleans, La.—The Board of Port Commissioners, New Court Building, is having plans prepared for a reinforced-concrete ferry house, Canal street, New Orleans. \$100,000. A. Owen, Interstate Bank Building, architect.

Grain Elevator, Montreal, Que.—Harbor Commissioners awarded the contract for an extension to grain elevator "B" at Windmill Point, providing additional handling capacity of 1,272,000 bushels, to E. G. M. Cape Company, Ltd., 10 Cathcart street.

Contract Awarded, Eudora, Ark.—Eudora Western Drainage District of Chicot County awarded the contract for 3,543,000 cubic yards of excavation and 9.1 mile channel clearing, Schedule D, to McWilliams Company, Inc., Exchange Building, Memphis, Tenn.

Elevator, Indianapolis, Ind.—Perins Mills, Inc., Emerson avenue and Pendleton Pike, plans five-story, 150 by 500 feet, and 1-story, 120 by 200 feet elevator, reinforced-concrete, Pendleton Pike. \$50,000. Engineering Investment Company, care of Guyer, engineers.

Contract Awarded, Detroit, Mich.—Public Lighting Commission, Atwater street, awarded a contract for constructing a wharf and dock, reinforced-concrete, at side of proposed lighting plant, to Greil Brothers, 100 Bulkhead E, Walnut street, Green Bay, Wis., \$417,400.

Dredging, Oakland, Cal.—The Alaska Packers' Association, Wells Fargo Building, San Francisco, awarded the contract for dredging in Oakland Estuary, 1,000,000 to 1,500,000 cubic yard excavation, to American Dredging Company, 255 California street, San Francisco.

Dredging, Manitowoc, Wis.—The contract for dredging Manitowoc River has been awarded to Simmons & Connell Dredge Company, 10 South La Salle street, Chicago, 23,000 cubic yards of dredge pan, \$2.30 per cubic yard and 70,000 cubic yards of softer material, \$0.44.

Woodwork for Shed, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, at their office, Suite 200, New Court Building, on June 28, for furnishing and erecting woodwork for the Market street shed. Requisition E. D. 13450.

Levees, Yuba City, Cal.—Reclamation District No. 40, care of State Reclamation Board, Forum Building, Sacramento, awarded a contract to Callahan Construction Company, City National Bank Building, Wichita Falls, Tex., for constructing levees, Yuba City, at \$500,000 or more.

Levee, etc., Prairie du Chien, Wis.—Crawford Company Levee and Drainage District, Court House, had plans prepared for 1,498,000 cubic yards of river levee work, 1,265,000 cubic yards bluff diversion, 278,200 cubic yards of drainage ditches, 22 miles transmission lines, pumping plant, etc.

Belt Conveyor, Memphis, Tenn.—Sealed proposals will be received at the office of the Mississippi River Commission, First and Second Districts, 1006 McCall Building, Memphis, Tenn., until 11 A. M., July 10, 1923, for furnishing and delivering one (1) belt conveyor. Further information on application.

Dock Front, etc., Conneaut Harbor (Conneaut, P. O.), Ohio.—Bids were received at the office of H. T. Porter, chief engineer, Bessemer & Lake Erie Railroad, Greenville, Pa., on June 25, for a reinforced-concrete dock front and dredging channel between present dock front and new dock front, etc., here.

Levee, New Orleans, La.—Louisville & Nashville Railroad, 10th street and Broadway, Louisville, Ky., and Southern Pacific Railroad, 165 Broadway, New York City, plan levee along Mississippi River, near New Orleans. \$100,000. G. R. Smiley, 10th and Broadway, Louisville, Ky., chief engineer of construction.

Freight Shed, New York, N. Y.—J. H. Delaney, Commissioner of Docks, Pier "A," foot of Battery Place, awarded the contract for a new freight shed on pier at foot of Roosevelt street, East River. Brooklyn Bridge Improvement, Manhattan Borough. Contract 1809, to McHarg Barton Company, 1328 Broadway, \$82,000.

Contract Awarded, Brooklyn, N. Y.—J. H. Delaney, Commissioner of Docks, Pier "A," foot of Battery Place, North River, New York, awarded the contract for dikes and dredging channel between Mill Basin and Paerdegat Basin, Jamaica Bay. Contract 1797, to Arundel Corporation, foot of Fulton street, \$172,220.

Woodwork for Grain Elevator Plant, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans at their office, Suite 200, New Court Building, on June 14, for furnishing and erecting woodwork for the grain elevator sacking plant shed and bins. Requisition E. D. 13517.

Pier, Charleston, S. C.—Sealed proposals were received by the Port Utilities Commission of Charleston, S. C., at its office, Room 712, People's Building, on June 14, for constructing with creosoted piles a pier at Market street, and a wharf at Columbus street, Charleston, S. C. Further information on application.

Pier, Charleston, S. C.—Sealed proposals were received by the Port Utilities Commission of Charleston, S. C., Room 712, Peoples Building, until noon, June 1, 1923, for constructing a pier (exclusive of earth fill) on Town Creek, Charleston Harbor. Further information on application. H. M. Gallagher, general manager.

Pier Development, Sanford, Fla.—W. T. Donnelly, consulting engineer, of 17 Battery Place, New York, has issued plans and specifications for pier development at Sanford, on behalf of the city. Bids returnable June 18. The work is expected to cost about \$70,000, being part of a scheme to ship Florida fruit by water from inland points to New York.

Creosoted Timber, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Orleans Court Building, on June 7, for furnishing approximately 520,000 feet board measure creosoted timber, and 1,228 creosoted piles in 70, 75, 80 and 85 foot lengths. Requisitions, ED-13518 and ED-13519.

Reconstruction of Wharf, New Orleans, La.—The Board of Commissioners of the Port of New Orleans, Suite 200, New Court Building, received sealed proposals on June 7 for the reconstruction of the Celeste Street Wharf and for the raising and rat-proofing of the remainder of the landing in rear of the same. Requisition, ED-13471. J. H. Walsh, general manager.

Dredging, Toms River, N. J.—Bids are desired by the Board of Commerce & Navigation, State House, Trenton, for (1) finishing incomplete contract for dredging canal, 75-foot bottom width, edge of Manasquan River; (2) removing remainder of material to make canal of 100-foot bottom width; (3) dredging channel Manasquan River, 100-foot bottom width, as far as funds will permit, \$70,000. V. Gelineva, director.

Wharves, etc., Beaumont, Tex.—The Houston Construction Company, 3102 McKinney avenue, Houston, was awarded the contract for 75,000 cubic yards of dredging and fill, \$16,500; 4,500 square yards of porous backing, \$2,700; 45 cubic yards of mass concrete, \$810; 1,400 lineal feet of wharf platform, \$119,000; 1,500 lineal feet of bulkhead, \$127,500, and 300 tons of stone riprap, \$900; total \$267,410.

Bond Issue, Fort Pierce, Fla.—The Board of County Commissioners called an election on a proposed \$220,000 bond issue for improvements to the Fort Pierce inlet, on June 25. The proposed inlet improvements include the deepening of the channel to a depth of fourteen feet and extension of both north and south jetties easterly and westerly to provide sufficient protection from the action of the waves and storms.

Sheet Metal Work, etc., New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Court Building, on June 21, for one contract for furnishing and erecting sheet metal work and glazing, and another contract for furnishing and erecting downspouts at the new sacking plant of the public grain elevator. Requisitions ED-13542-downspouts, and ED-13543-sheetmetal work and glazing.

Earthwork, St. Louis, Mo.—The La Crosse Dredging Company, Plymouth Building, Minneapolis, Minn., was awarded two contracts by the Mississippi River Commission, 1311 International Life Building, as follows: 645,000 cubic yards of earthwork in Iowa River-Flint Creek Levee District 16, Iowa, and 300,000 cubic yards of earthwork in Louisiana County Levee District 15, Iowa; \$0.28 per cubic yard, total \$180,000, and \$0.1875 per cubic yard, total \$56,250, respectively.

New Warehouse, Tampa, Fla.—According to recent announcement, work is to start on July 1 on the new warehouse of the Swann Terminals. The building is to include every modern facility used in terminal warehouses, to be five stories high, contain more than 300,000 square feet of floor space and will cost approximately \$500,000. Space will be provided for permanent tenants in various wholesale lines. The building will have ample dock, wharf, and railroad facilities.

Dredging, Canada.—The Department of Public Works, Ottawa, Ont., awarded the following contracts to Soo Dredging and Construction Company, Saulte Ste. Marie, Ont., dredging at Saulte Ste. Marie, Ont., \$18,200; Randolph-MacDonald Company, Crown Office Building, Toronto, Ont., at Bowmanville, Ont., \$6,500; Frontenac Dredging Company, Kingston, Ont., at Port Hope, Ont., \$6,500; Dufresne & Marchelidon, Three Rivers, Que., at Nicolet, Que., \$10,000, and St. Pierre, Que., \$8,000; Lachance, Ltd., 99 Dalhousie street, Quebec, Que., at Riviere du Loupe, Que., \$6,000.

Steel Framing, etc., New Orleans, La.—Sealed proposals will be received by the Board of Commissioners of the Port of New Orleans, at their office, Suite 200, New Court Building, until 3:00 P. M., July 5, 1923, for furnishing and erecting at Poland Street Landing under two separate contracts: A—Structural steel framing for shed, approximately 216 tons (Requisition E. D. 13534); and, B—Steel rolling doors, approximately 4,560 square feet (Requisition E. D. 13555). Requisitions E. C. 13554 and E. D. 13555.

GOVERNMENT WORK

Dredging, Bids Rejected, Baltimore, Md.—U. S. Engineer, Baltimore, rejected bids for dredging in Chabonne Harbor.

Superstructure, Detroit, Mich.—U. S. Engineer, 337 Federal Building, rejected bids for superstructure on west center pier, St. Marys Falls Canal.

Dredging, San Diego, Cal.—U. S. Engineer, Central Building, Los Angeles, received bids, June 2, for dredging in San Diego Harbor, 480,000 cubic yards.

Dredging, Providence, R. I.—U. S. Engineer Office, Providence, received sealed proposals on June 20 for dredging and rock excavation in Black Rock Channel, Buffalo, N. Y.

Dredging, Wilmington, N. C.—Sealed proposals were received by U. S. Engineer Office, Wilmington, N. C., on June 19, for dredging in Scuppernon River, North Carolina.

Jetty Repairs, Galveston, Tex.—Sealed proposals were received by U. S. Engineer Office, Galveston, on June 22, for repairing, building up and extending the West Jetty at Sabine Pass, Tex.

Stone, Chicago, Ill.—U. S. Engineer, 537 South Dearborn street, has awarded the contract for crushed stone or gravel in Calumet Harbor, to L. D. Smith Stone Company, Sturgeon Bay, Wis., \$9,660.

Contract Awarded, Wilmington, Del.—U. S. Engineer Office awarded the contract for dredging Tucker Creek, N. J., to Delaware Dredging Company, 139 South third street, Philadelphia, Pa., \$9,180.

Bids on Buoys, Tompkinsville, N. Y.—The Superintendent of Lighthouses, Third District, at Tompkinsville, Staten Island, received sealed proposals on June 18 for furnishing and delivering a total of nine buoys.

Steel Oil Barges, Cincinnati, O.—Sealed proposals were received on June 22, by U. S. Engineer Office, Cincinnati, for the construction and delivery of two 1,800-barrel steel oil barges, 100 feet by 30 feet by 6 feet.

Steel Hull, New York, N. Y.—Sealed proposals were received by U. S. Engineer, Room 710, Army Building, 39 Whitehall street, New York, on June 21, for constructing and delivering one steel hull for quarter boat.

Superstructure, Dunkirk, N. Y.—U. S. Engineer, Federal Building, Buffalo, awarded the contract for a stone superstructure on breakwater at Buffalo, to Central Dredging Company, Bangor Building, Cleveland, Ohio. \$58,860.

Sale of Condemned Material, Newport, R. I.—A sale of condemned material belonging to the United States Navy will be held at the Naval Torpedo Station, Newport, R. I., on July 3, at 11 A. M. (daylight saving time).

Stone, Wilmington, N. C.—Sealed proposals, in duplicate, were received at the office of the U. S. Engineer, Wilmington, N. C., on June 15, for furnishing and delivering stone, f. o. b. Wilmington, N. C. Proposal No. 1877.

Dredging, etc., Richmond, Cal.—Bids were received June 1, at the office of the U. S. Engineer, Custom House, San Francisco, for dredging 910,000 cubic yards and building 2,000 lineal feet of retaining wall in Richmond Harbor.

Steel Piling, Addison, Ky.—U. S. Engineer, P. O. Box 72, Louisville, awarded the contract for furnishing 435 tons of steel sheet piling, for Dam 45, Ohio River, Addison, f. o. b. Louisville, to Bethlehem Steel Company, Bethlehem, Pa. \$26,000.

Dredging, etc., Chicago, Ill.—U. S. Engineer, 537 South Dearborn street, awarded the contract for dredging and pier removal in Calumet Harbor and River, Illinois and Indiana, to Fitzsimmons & Connell Dredge & Dock Company, 10 South LaSalle street, \$70,614.

Dredging, New Orleans, La.—Grant, Smith & Company, Raceland, received the contract awarded by the U. S. Engineer, 329 Custom House, for dredging Intracoastal Waterway between Bayou Black and Bayou Terrebonne, 333,000 cubic yards, \$0.23 per cubic yard.

Sluice Gates, etc., Florence, Ala.—U. S. Engineer Office, Florence, Ala., received sealed proposals on June 23 for furnishing and delivering 13 sets of sluice valves, operating mechanism for the same, riveted steel pipe and other appurtenances for the sluice section of Wilson Dam.

Proposals for Iron Chain, Tompkinsville, N. Y.—The Superintendent of Lighthouses for the Third District at Tompkinsville, Staten Island, will receive sealed proposals until 2 P. M., on July 5, for iron stud link light vessel chain and iron open link buoy chain. Further information upon application.

Two Steel Oil Tanks, Memphis, Tenn.—Sealed proposals will be received by U. S. Engineer Office, Mississippi River Dredging District, Post Office Box 1017, Memphis, Tenn., for constructing, delivering and erecting two steel fuel oil storage tanks at U. S. Dredge Depot, until 9:30 A. M., July 19. Further information on application.

Dredging, Los Angeles, Cal.—The San Francisco Bridge Company, Nevada Bank Building, San Francisco, Cal., was awarded the contract for widening Los Angeles Inner Harbor entrance channel—Area 3, \$419,226; and F. C. Franks Construction Company, American National Bank Building, San Fran-

cisco—Areas 4, 5 and 6, \$337,953, by U. S. Engineer Office.

Dredging, New York, N. Y.—The contracts for dredging in New York and New Jersey Channels, Area 1 to Great Lakes Dredge Company, 17 State street, \$229,425; Area 4, to Morris & Cummings Dredging Company, 17 State street, \$226,152; Areas 5 and 6, to Taylor Dredging Company, foot of Communipaw avenue, Jersey City, N. J., \$330,534, have been awarded by U. S. Engineer, 2nd District, Army Building, New York.

Lumber, Louisville, Ky.—U. S. Engineer Office, P. O. Box 72, has awarded the following contracts: furnishing 100 pieces 3 and 4 by 10 inches by 30 feet rough oak; 125 pieces 12 by 12 inches by 12 feet oak; 120 pieces 2 and 6 by 12 inches by 14 feet oak, and 35,000 feet long leaf yellow pine, to Marsh & Truman Lumber Company, 332 South Michigan avenue, Chicago, \$3,368, and Hayden & Westcott Lumber Company, 80 East Jackson Boulevard, Chicago, \$1,606.

New Storage Yard, Florida.—It has been announced from Florida that historic Fort Norfolk, a show place preserved for a century, will be razed and turned into a storage yard for buoys by the lighthouse service unless some unforeseen powers step in to prevent. Application has been made by the lighthouse department to the U. S. Army District Engineer for permission to construct piers, warehouses and storage places for vessels and buoys on the section allotted to that service recently by the Government.

Anchorage Improvement, Norfolk, Va.—Enlargement and improvement of the anchorage grounds off Craney Island and Lambert's Point in the Norfolk harbor has been tentatively approved by the Chief of Army Engineers. Authority for survey and preparation of the project has been received by Major D. D. Pullen, U. S. Army district engineer here, from the Chief of Engineers, with instructions to proceed immediately with compilation of figures to show the costs, the amount of work to be done, and the results to be attained.

Earthwork, New Orleans, La.—U. S. Engineer, 4th District, Custom House, awarded the following contracts in connection with 1,907,100 cubic yards of earthwork in Atchafalaya and surrounding districts: to D. B. Hearin & Son, New Raymond Building, Baton Rouge, St. Cloud Levee, \$18,810; to O. O. Ogden, Roumain Building, Baton Rouge, Nina Levee, \$77,400; to Lafourche Basin Levee Board, Donaldsville, Live Oak Levee, \$20,700; to H. A. Schoenberger, Triumph, Ballay Levee, \$4,025; Lee Rice Levee, \$4,370; Crombie Levee, \$2,208, and Bicks Levee, \$3,910; to Lower Coast Construction Company, Ltd., 122 Chartres street, Bowden Levee, \$18,720.

MARINE SOCIETIES

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11 Broadway, New York
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Institute of Marine Engineers, Incorporated

The Minorities, Tower Hill, London.

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Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

August, 1923

No. 8

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY

30 Church Street, New York

F. B. WEBSTER, Editor

H. H. BROWN, Managing Editor

L. S. BLODGETT, Associate Editor

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Contributing Editors

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MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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A Real Saving

THE Fuel Conservation Committee created by Mr. Joseph E. Sheedy, vice-president of the Emergency Fleet Corporation, has accomplished a real saving in the amount of fuel consumed on Government ships. In spite of the increase of ship-miles covered by Shipping Board vessels and the material advance in the price of oil, the monthly expenditure for fuel has been kept at a constant figure. It is significant that, during the life of the committee, practically every other operating cost has, due to the higher prices of material and labor, been materially increased. This gratifying showing is due apparently to advantageous fuel oil contracts and also in considerable measure to the work of the Fuel Conservation Committee.

Fuel is the largest direct operating cost and the logical place to make the greatest saving. With this in mind the fuel committee had estimates made of the number of miles every Government ship in operation ought to make on a ton of fuel. When these figures were furnished to the chief engineers there was an immediate improvement in efficiency for they were an incentive for every engineer to do his best. They gave him a mark to shoot at and they also gave him the knowledge that someone was taking an interest in his personal work. It is human nature for good men to do their best when they know that credit will be given honest efforts.

Of course there were cases where the efficiency obtained was not what it should be and in such instances a thorough investigation was made to determine the cause. A notable

case where a great improvement was accomplished was on the *America* where changes in the boilers effected very large savings.

In addition to this, the Fuel Committee organized a school for engineers through the courtesy of the Navy Department at the testing plant of the Philadelphia Navy Yard. Here an intensive five-day course in the art of burning oil has been carried on since November. It has been open to engineers of both Government and privately-owned ships. The greatest endorsement that can be given to this school is the fact that the graduates have spread the news of the benefits that they have derived from taking this course to such good effect that it has been necessary to double the number of the classes.

Economy is the ideal of all true engineers. The avoidance of waste is one of Secretary Hoover's pet hobbies. Getting the business is important, freight rates are important but it is also true that those who have made the greatest success in shipping are those who have paid the best attention to reducing costs. Those who like their work will do it efficiently.

Two More Fast Ships Needed

IT is very gratifying to note the interest that the general public has taken in the *Leviathan*. Her reconditioning into a premier ocean liner has been accomplished with such skill that every American ought to be proud of the work of the Newport News Shipbuilding and Dry Dock Company and, judging from the amount of newspaper publicity that has been given to this great ship, something resembling that pride which our ancestors took in shipping has been revived in the public at large.

But the *Leviathan* has not and will not have a fair chance to make a financial success unless and until two more ships capable of making at least twenty knots are built and placed on the berth with her. This fact is well known to our foreign competitors, especially those who are at present prepared and do furnish a weekly express service.

Passengers cannot be expected whether going or returning to wait three weeks for a particular ship and, as to the forwarders of express freight, who are given a weekly service by English vessels, it will be out of the question no matter how patriotic they may be to expect them to disrupt their business and interrupt the fast delivery of their products in order to favor the *Leviathan*.

It is unfortunate that the age of the *Agamemnon* and *Mt. Vernon* and the cost of reconditioning them are such that the Shipping Board has felt it necessary to condemn the project of returning them to service. Whether or not they would

make a financial return on their conversion cost, they would at least fill a gap until they could be replaced with new ships and they might, in this way, be the means of deciding the destiny of one of our two great American transatlantic steamship lines.

Our great fleet of freight ships cost us many times what the Shipping Board would be only too glad to accept for them now. We hear a lot about the cost of their construction, but we hear very little about what these ex-German liners saved us in transporting troops. We would have paid to the owners of the *Leviathan* alone, if she had been under foreign control, something like \$42,000,000 for the passage money of the soldiers that she carried.

In other words, the ex-German liners have a credit balance for actual services on the ledger which ought amply to justify the construction of two new vessels. Naval experts know the actual need for such ships under American control, which is decidedly more urgent since the Disarmament Conference, and shipping experts know that they are absolutely necessary as running mates for the *Leviathan*. We must and will get these ships and, when we do, we will be just as proud of them as we are of our premier ship today.

Marine Insurance Dull

MARINE underwriters are viewing the business let-down of the last few weeks with misgivings. They are wondering whether it is merely a seasonal reaction, or an ominous attestation of the commercial decline of which one hears so much these days. Beyond question, the prevailing scale of prices in the United States, due to high costs of production, puts Americans at a considerable disadvantage in the export of manufactured goods. Dull foreign trade means dull marine insurance. It is the general opinion that underwriters made no money during the first half of 1923. Losses have been heavy and premiums have scarcely equaled the volume for the corresponding period of last year. The summer months are bringing little relief. The likelihood of profit in 1923 is steadily growing more and more remote. It seems certain that our export of manufactured products will continue to decline in comparison with the export trade of other countries, and the more progress Europe makes in getting on her feet, the more competition will this country feel in her export trade of manufactured merchandise. The bright side of the apparent cloud lies in the reflection in our raw products' trade, such as copper, cotton, grains, etc., of future orders from abroad when European nations get more upon their feet and undertake an expansion of their business. This is the time for sound sense and the best brand of courage we can all command.

Writing the Rum-Runners

MARINE underwriters are frequently queried concerning the liability for damage to vessels and cargoes arising out of the activity of that class of bootleggers known as rum-runners. And not without reason. From time to time reports reach shore of collisions with mysterious craft and of damage done vagrant vessels and legitimate carriers alike; and the source of this injury is

clouded and obscure. Too often the rum-runner is in the offing and to blame for the disaster. What are the rights of all concerned in this case, so far as their insurance protection goes?

The legality of the venture is one of the implied warranties of marine insurance. This, naturally, precludes recovery under American policies for damage to vessels engaged in rum-running, or to their cargoes. Under the laws of misrepresentation and concealment, it would appear to be incumbent upon the party seeking insurance to make known to the insurer the character of the business in which the applicant is engaged. Damage to a vessel engaged in legal trade, due to collision with a smuggler, is, of course, recoverable under the American policy. However, there would not be much difficulty for an American to obtain insurance in Great Britain covering smuggling operations, because the United Kingdom does not recognize the laws of a foreign nation to the extent of permitting such laws to invalidate contracts made in Great Britain when the contract is within the British law. It would appear, therefore, that any protection desired in this form of activity must be sought outside the United States.

Deviation Charges

IT is not always clear to shippers why they should be charged extra for a deviation from the set route at sea.

They complain to their underwriters that they have not profited by such a change of course and ought not to have to pay on account of it. There is good and sufficient reason, just the same. When the insurer makes up his rate he takes into careful consideration every hazard involved in sailing from one given point to another, along an agreed course. The moment the voyage is altered and additional harbors are made there arise numerous hazards that he had not taken into account. No vessel can enter and leave a harbor without running increased risk of collision and stranding, not to mention perils involved in the opening of hatches for coaling or cargoing the vessel, one of the most dangerous of which is fire.

Illustrations abound in substantiation of this attitude of the underwriter. A short time ago a large Lamport & Holt liner went aground at Bermuda when entering the channel off Hamilton, and her position, for a time, threatened to prevent the entrance of a regular steamer of call. She was bound to New York from South America, and although the bill of lading may not have construed a stop at Bermuda as a deviation it most certainly was such by the terms of the insurance policy. Fortunately the steamer was floated in time to save the insurers a heavy loss, but it might easily have cost the New York insurance district thousands of dollars. The Pacific Coast, several months ago, supplied a still more dramatic illustration of the perils involved in deviations. The *Welsh Prince* went aground in an attempt to deviate for extra cargo at Portland, Ore., and became a total loss. The underwriters were called upon to foot the bill, which ran into a round million dollars. Is this not a hazard worth an additional rate? And the charge is trifling—only from five cents to seven and a half cents per hundred dollars. It can scarcely be considered exorbitant.

Leviathan Awakens America's Interest in Shipping

Race with Majestic Would Stimulate Favorable Public Opinion—Two More Ships Comparable in Speed Needed to Establish Weekly Service

By "Old Scotch"

TO the American marine public, torn with conflicting emotions as to our future and jaded with continuous depression in business the completion and official trials of the *Leviathan* came at a psychological time to stir up shipping sentiment as no other event has done in several years.

The attack of partisan journals on the so-called "joy ride at the tax-payer's expense" riveted public attention to this "Queen of the Seas" as nothing else could have done. Since the advent of the *Great Eastern*, over seventy-five years ago, no single ship has ever been so much in the public eye, not alone in this country but in every maritime country in the world. Chairman Lasker, professional advertising man as he is, could have devised no better means for putting this great ship on the map than the trial trip which he initiated, supervised and brought to such a successful ending. Threats of injunctions and Congressional investigations deterred him not, for he was assured by all experienced shipping men that he was pursuing a perfectly legitimate and necessary course. The small additional sum to feed the guests on board during the trial paled into insignificance in comparison with the financial returns which will accrue as a direct result of the wonderful amount of advertising resulting from the newspaper attacks.

What rival steamship line would not have pulled off a much more expensive trial, if they could have been reasonably sure of even one-half the gratuitous advertising which the *Leviathan's* trial received?

THE LEVIATHAN'S SPEED

The announced speed obtained meant just exactly what it stated, no more, no less. That it was made in the Gulf Stream, with possibly three or four knots favoring current, is known to all who are familiar with shipping. All the crack runs of rival ships, let it be noted, are given out on the eastbound trips, where the Gulf Stream is an advantage. Why have not rival ships given out record runs westbound? The answer is for the same reason as those obtaining for the *Leviathan's* run—advertising. The public at large little care for attendant circumstances. Americans for once out-advertised foreign competitors by taking advantage of a little more current than the other fellows.

RACE WITH THE MAJESTIC PROPOSED

As a really sporting proposition none of those "record runs" of rival greyhounds amount to anything in the minds of seafaring people. Conditions of wind, sea and currents vary so much at sea, that it is not alone impossible but inadvisable to consider seriously the record made by any ship which speeds alone on ocean lanes. Spasmodically we indulge in International yacht races, where all competitors are on an equal basis as to weather and tidal conditions. There, real class of vessel and skill of navigators are at stake. At his time the greatest sporting event on the ocean that the world has ever seen would be to put the *Leviathan* and the *Majestic*, for example, side by side off Ambrose Light, give them an even start and the first one to reach Daunt's Rock or Cherbourg Breakwater can well be proclaimed the better ship. Then all arguments about sea temperatures, favoring currents or weather conditions would be dispelled. It would be a battle royal between engineers and navigators of the United States and Great Britain. Needless to say every

available inch of passenger accommodations would be taken on both ships.

The ludicrous part of such a race would be the fact that America and England would be battling for transatlantic supremacy with German-built ships. Even so, they have both been overhauled and reconditioned by the best talent in England and America, and the test would be fairly indicative of the available skill in both countries, in shipyards and among sea-goers.

Such a race would attract the attention of every citizen in both countries no matter how remote they might be from the seaboard. All English speaking people go in for fair sports and, instead of engendering any ill-feeling between the two great Anglo-Saxon nations, the reverse would undoubtedly result.

The benefit to the American merchant marine would be incalculable. The farmers and cowboys of our great inland empire would no doubt be as much interested and excited over such an international contest as the people living along our seaboard. If perchance our pet ship should be whipped, it is dollars to doughnuts that we would go after the championship with renewed vigor, and the next contestant flying our flag would be a ship designed and built in our own yards, and manned by our own people throughout.

It is safe to say that the American merchant marine has already received more of an impetus from the great publicity attached to the *Leviathan* trials than it did from all the campaign of education which we launched during the consideration of the late-lamented shipping bill. All it needs now to put over the great idea of American ships is to stage a *Leviathan-Majestic* overseas race. From quoted expressions of British captains, they are willing to engage in such an encounter. Are we not just as good sportsmen, and have we ever before been unwilling to back up our own ships in any contest of this kind? Newspaper records with all the attendant bluffs get us nowhere. Let's be game!

PASSENGERS ENTHUSIASTIC OVER VESSEL'S PERFORMANCE

The fortunate guests who participated in the now famous trial of the *Leviathan* were as representative a body of Americans as have ever been gathered together in any ship under the American flag. Leading men in the shipping business, railroad presidents, great business men, prominent journalists, and well known citizens from all parts of the country mingled together and got a better idea of the possibilities of an American merchant marine than could be obtained in any manner ever devised. Their enthusiasm was unbounded, as is best evidenced by the spirit displayed in raising in a few moments a purse of six thousand dollars to be distributed among the engineering force, whom they readily saw were the portion of the crew to whom credit for the splendid performance was due. Incidentally, this is probably the first instance on record where favors and praise were bestowed on the right people for a creditable performance of a steamship.

A further evidence of the fine spirit developed, was the announcement of several very prominent business men who were on board, to the effect that hereafter their buyers, who make hundreds of trips annually to Europe, would be directed to patronize American ships exclusively. That development alone was worth more than the entire expenses of the trial trip. When we consider that over seventy-five per-

cent of all money spent in transporting persons and goods between the United States and Europe emanates from our own pockets, is it not time that we gave heed to keeping a fair proportion of this money at home?

THE LEVIATHAN GOES INTO SERVICE

The sailing of the *Leviathan* on Independence Day was witnessed by a crowd of over 15,000 people massed around her pier, and by countless thousands from the densely populated portions of the great city bordering on or in sight of the harbor. The weather conditions at the time may be, we trust, quite prophetic of the future of our shipping efforts. She started to back out from the wharf promptly at the appointed hour amid the din of steam whistles and the whirring of airplanes overhead, but the heavens broke loose with an inundation of rain which compelled every one to scatter for shelter. She started majestically down the harbor under dark, lowering clouds and an atmosphere through which it was most difficult to grope. Before reaching the open sea, the clouds had disappeared and the brilliant July sunshine made the spectacle of America's pride starting on her first voyage a marine spectacle long to be pleasantly remembered.

Although our merchant marine endeavors are now struggling with adverse conditions, who can or will say that these temporary clouds will not soon disappear, and that the warm sunshine of public approval and a determination to succeed will not eventuate in scattering the clouds of adversity which up to this time have tended to discourage us?

TWO MORE FAST SHIPS SHOULD BE BUILT

It will be difficult and, in fact, impossible to maintain adequate service under the American flag with but one first-class vessel like the *Leviathan*. Let us all get behind the Shipping Board's announced policy of asking Congress to appropriate money to construct two more comparable ships for the North Atlantic trade, so that Americans can travel to distant lands under our own flag. The Board has the

money and all that Congress needs do is to make it available for this new construction. Our yards are at present capable of turning out two ships which will lead the world for comfort, size and speed. In a few years under the present outlook, we will not have the necessary facilities and talent for building such ships.

Our national pride and the dictates of self defense and commonsense all demand that we should build two such ships. A trio of such fast and commodious vessels are absolute essentials in our program of national defense, and, for that purpose alone, the expenditure of the necessary money would be more than justifiable. With the proper national spirit behind them, such as has already been started by the advent of the *Leviathan*, there is but little question that they would be a good instrument financially, either in public or private hands.

Let us all unite in the toast "Hail *Leviathan* Redivivus, and may good luck attend you everywhere!"

AUXILIARY SAILING HOUSEBOAT LAUNCHED.—Mr. Fred S. Fish's auxiliary sailing houseboat *Moby Dick*, designed by Henry J. Gielow, Inc., New York, which was launched at the Harlan Plant of the Bethlehem Shipbuilding Corporation, Ltd., Wilmington, Del., on June 30 is an interesting example of a high grade craft of a type especially designed and adapted for shallow draft cruising in localities such as the Florida waters. It is the second of the same type to be launched this season at the Harlan Plant, the other being Mr. Keith Spalding's auxiliary schooner yacht *Goodwill*. The auxiliary power is furnished by a Diesel engine and ample accommodations have been provided for guests and crew, quarters being available for ten of the former and eight of the latter. The vessel is 120 feet long overall, 24 feet 8 inches molded beam, 10 feet 8 7/16 inches molded depth and will have a draft of 6 feet 10 inches.

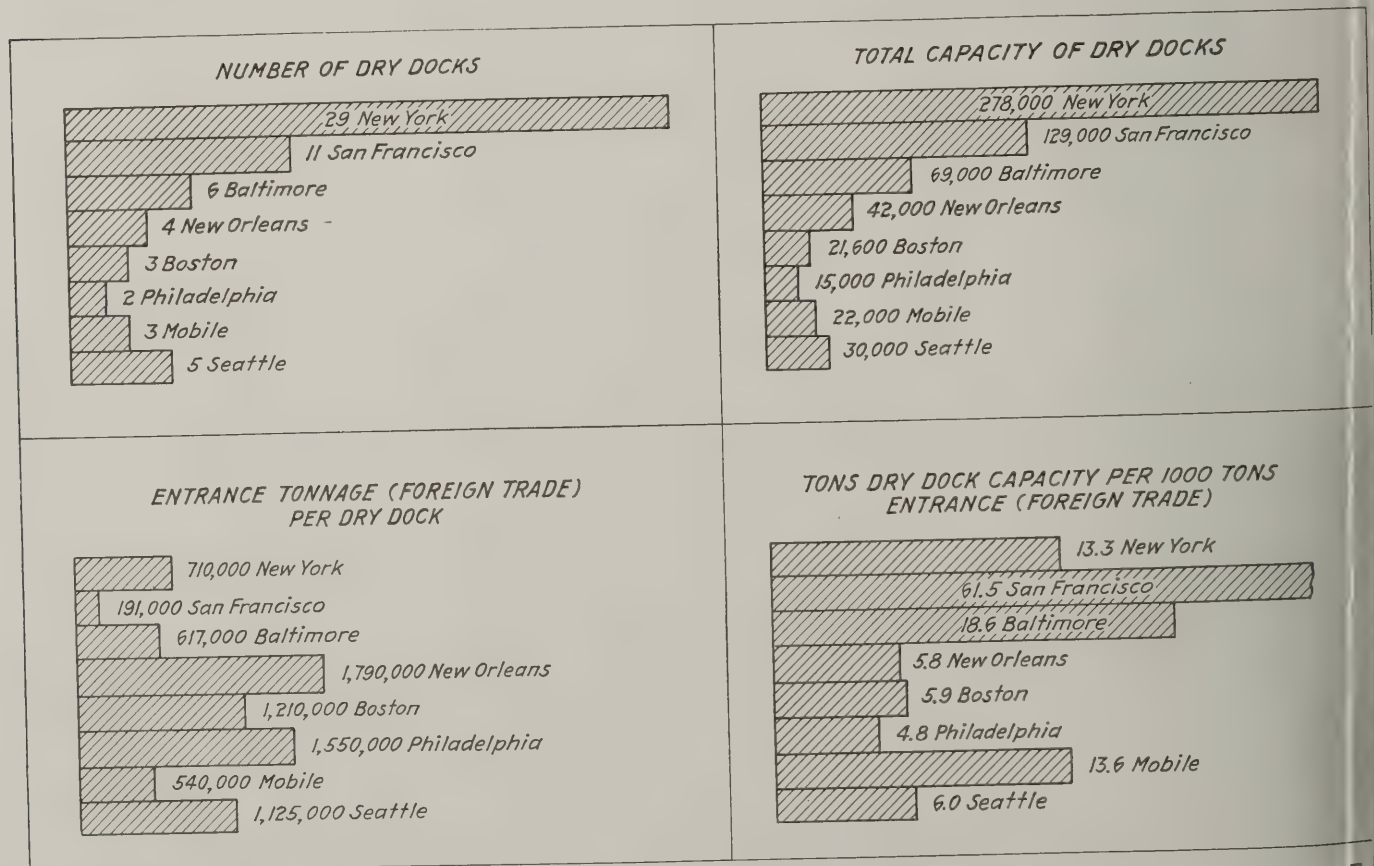


Chart Furnished by the Crandall Engineering Company, Boston, Mass., Showing Number of Dry Docks for Ships 350 Feet Long and Over in Comparison with Entrance Tonnage as of March, 1923



S. S. Albert Ballin Nearing Completion at Blohm and Voss Shipyard, Hamburg, Germany

The Twin Screw Turbine Steamer Albert Ballin

New Hamburg-American Liner Fitted With Stability
Bulges and Anti-Rolling Tanks Placed on New York Berth

By Dr. Ing. E. Foerster

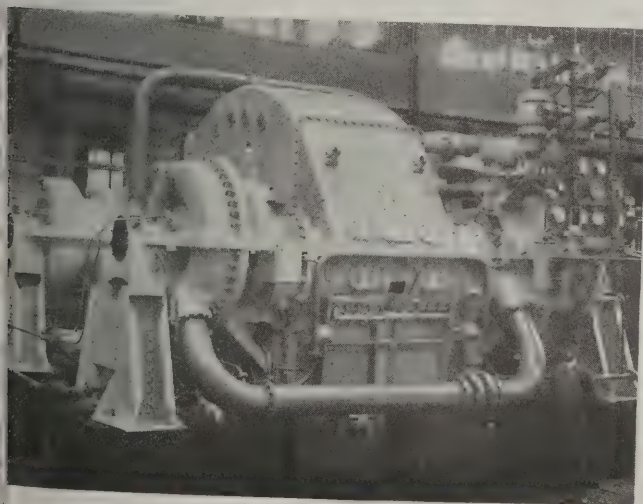
AFTER the great war, through which Germany lost practically its entire mercantile fleet, she has endeavored to rebuild at least those units which would enable the reorganization of some few main passenger lines crossing the North and South Atlantics.

With respect to the River Plate service, the most remarkable vessel now in that trade (the 21,000-ton triple screw liner *Cap Polonio*) was rebought by their pre-war German owners, after she had been delivered to the Allies according to the treaty of Versailles. This steamer, therefore, is representing the German passenger traffic in that trade together with some smaller liners of the same company and of the Hamburg-American Line.

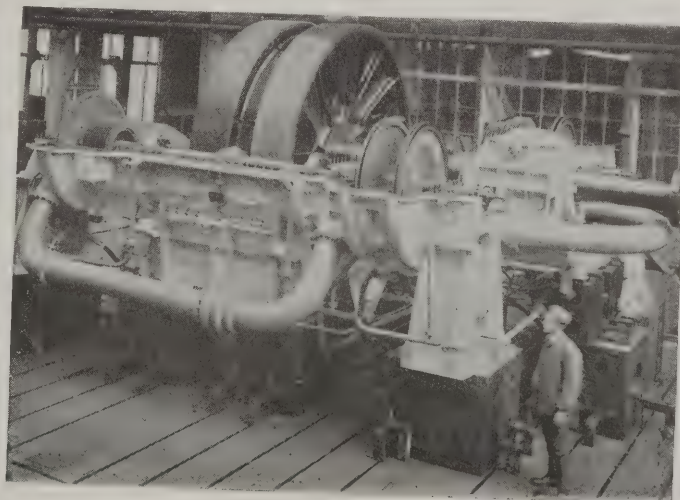
On the North Atlantic practically all vessels of value were transferred, by the treaty, to British and American owners, the most significant ones being the *Vaterland*

(*Leviathan*) and the *Bismarck* (*Majestic*) both having been built by Blohm & Voss for the Hamburg-American Line.

With respect to passenger service, the Hamburg-American Line has reconditioned the former express liner *Deutschland* as a 17-knot freight and passenger steamer, and it has also built the *Thuringia* and *Westfalia*, all running in a special fixed agreement with the United American Lines. This latter progressive shipping concern bought from Holland the two formerly German River Plate liners *Resolute* and *Reliance* which in 1915 had been sold to the Royal Dutch Lloyd by the Hamburg-American Line. With these and other vessels the United American Lines and the Hamburg-American Line are running a regular service between the United States and Europe, the German partner aiming, however, at an improved representation in this combine, more in keeping with its traditions. The foregoing are, therefore,



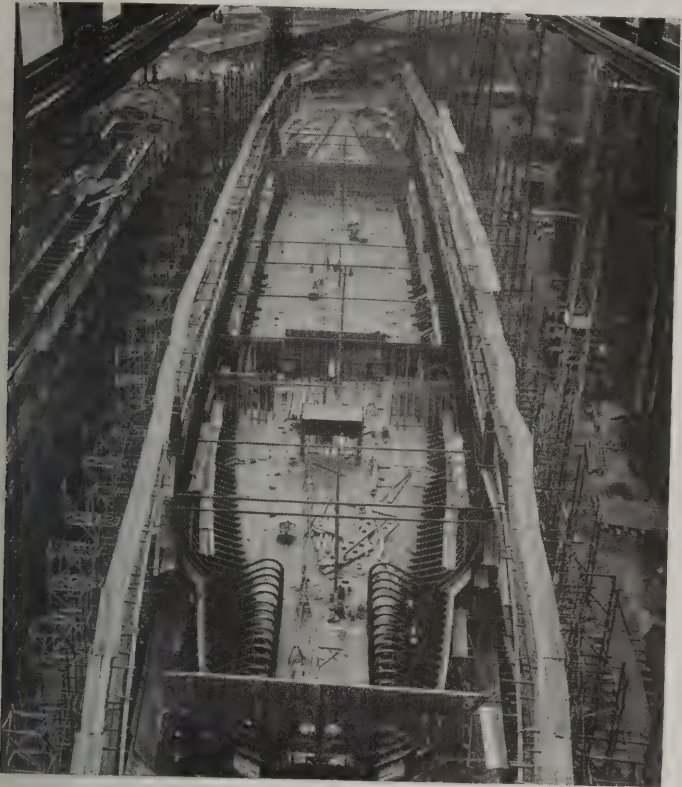
Propelling Machinery with Gear Box Closed



Starboard Propelling Unit with Upper Casing Removed



S. S. Albert Ballin: (1) Social Hall, (2) Dining Room, (3) Ladies' Lounge, (4) The Vessel in Service, (5) Smoking Room, (6) and (7) First Class Staterooms

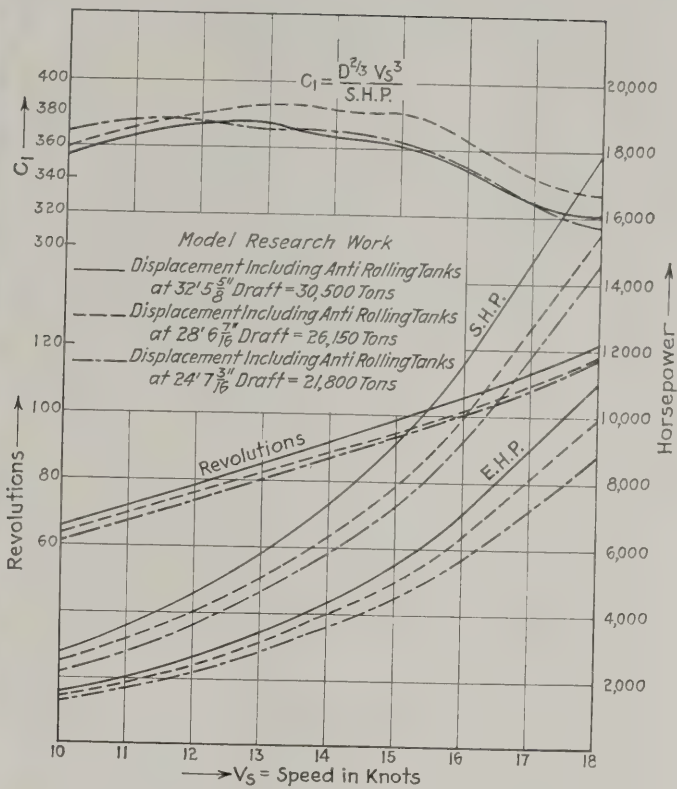


View of Hull During Erection

the conditions which led to the building of the new Hamburg-American liner *Albert Ballin*.

One of the most striking novelties in this new vessel is the adaption of stabilizing bulges in the waterline, a proposal of the writer, who first recommended this method of local treatment of the question of stability" for River Plate steamers, in order to compensate by automatically increasing the stability of form for the loss of stability during the voyage, caused by the consumption of coal, oil, fuel, feed and fresh water, the maximum beam of the bulges, in this case, being in the "waterline of arrival."

In the case of the *Albert Ballin*, this principle has been adopted in order to save beam, meaning, that the beam necessary for the accommodations, was less than the beam which was necessary for stability. The latter was obtained on the principle of local bulges while the vessel's main beam (clas-



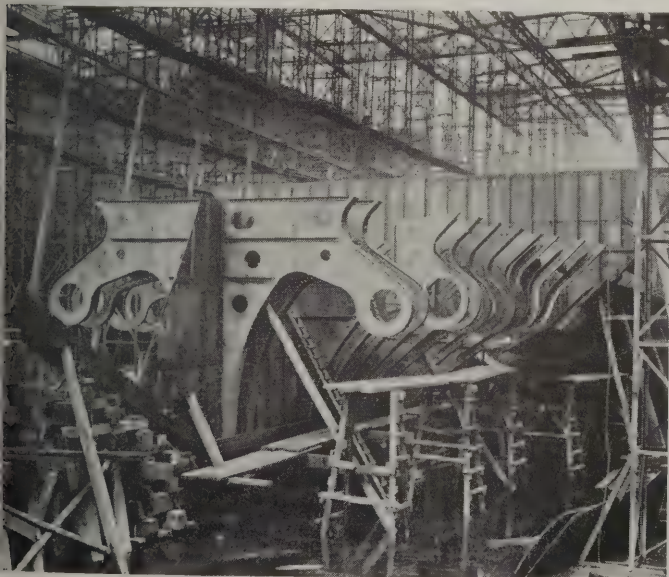
Performance Curves Based on Model Research Work

sification beam) remained on the practical basis of the lower figure. The *Cap Polonio* herself and a good deal of model tank research work in connection with the design of the *Albert Ballin* has proved the physical phenomenon, that the resistance of a given ship is, in higher speeds, diminished by adding bulges—and only very slightly, or practically not at all increased at lower speeds.

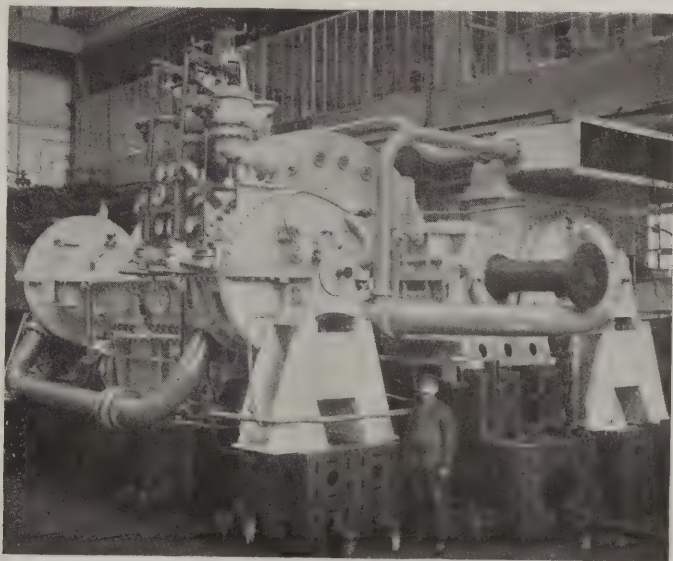
In combination with these bulges the new system of Dr. Frahm's anti-rolling tanks is adopted—a part of the bulges being used for this purpose and therefore communicating with the sea by openings in the outer hull.

The design of the superstructure is influenced by the merits of the bulges, showing a relatively high development especially of the bridge decks.

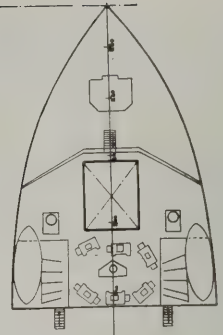
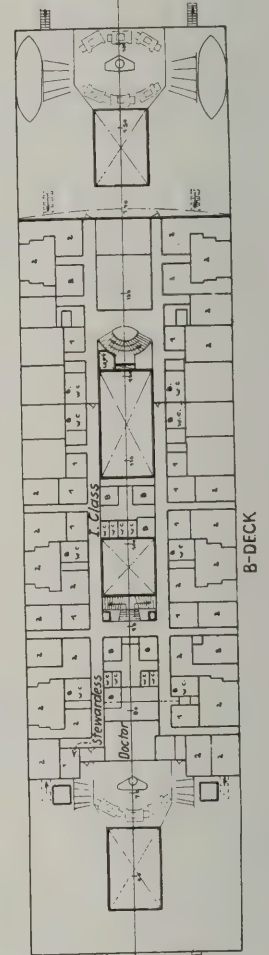
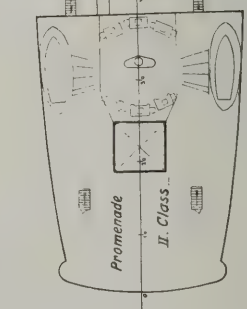
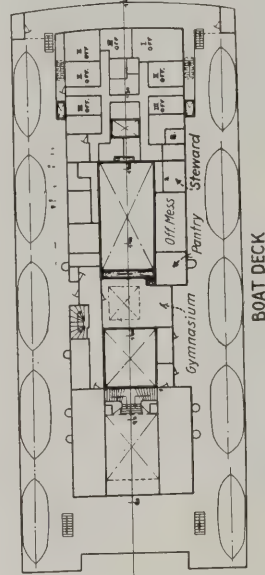
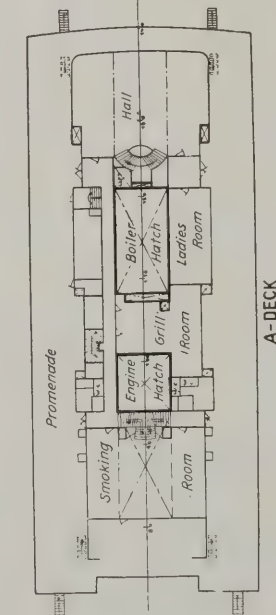
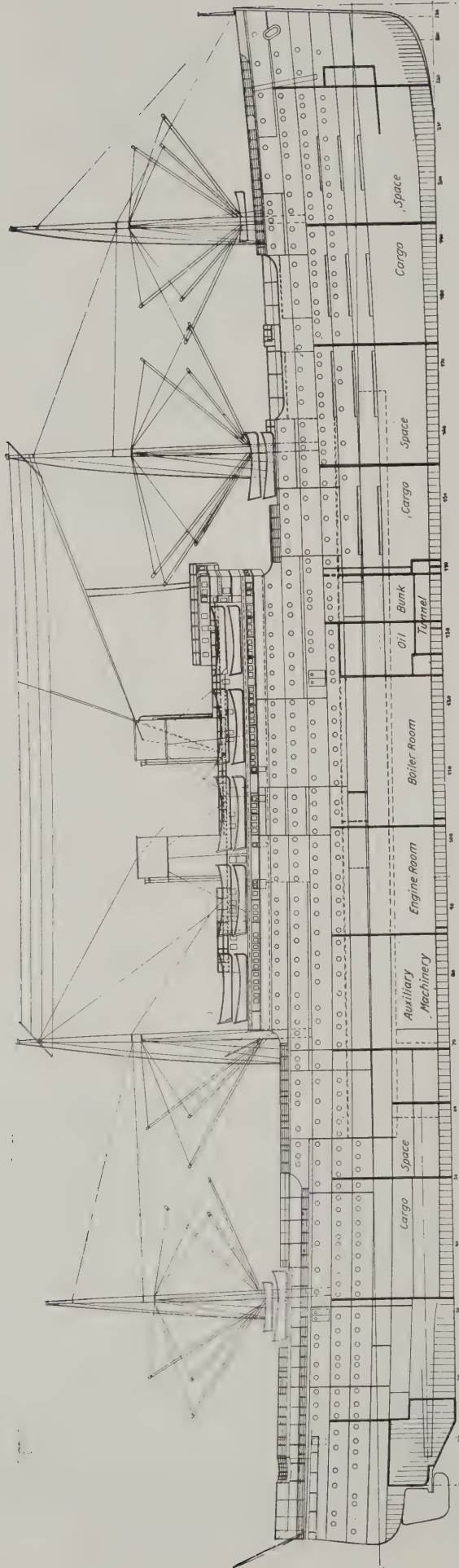
The *Albert Ballin* has been built by Blohm and Voss to the highest class of the Germanischer Lloyd of best mild



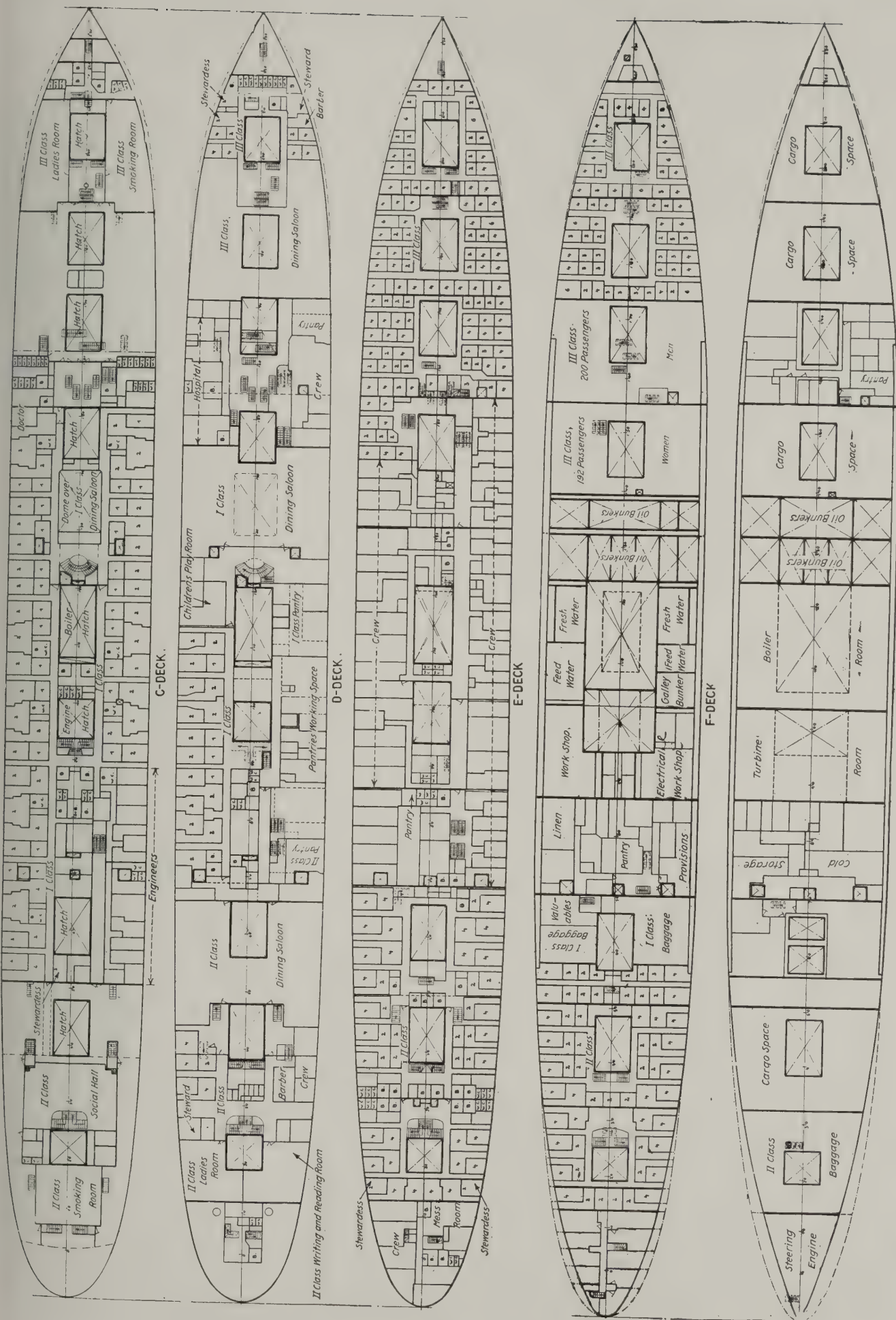
Spectacle Framing



Complete Unit of Turbines, Reduction Gears and Main Shaft



S. S. Albert Ballin: Outboard Profile and Upper Deck Plans



S. S. Albert Ballin: Deck Plans

General Data: New German Liner Albert Ballin

General Information

Service: Hamburg-New York.
Builder: Blohm and Voss, Hamburg.
Owner: Hamburg American Line.

Characteristics

Length, overall	627'	15 1/2"
Length, B. P.	599'	10 15/16"
Breadth, molded over bulge	78'	8 5/8"
Depth, molded	55'	6"
Draft, loaded	32'	7 1/2"
Speed, loaded, knots	16	
Framing	Deep framed	
Class	Germanischer Lloyd	
Deadweight capacity	13,500 tons	

Equipment

Anchors: 3 Bower 14,068 lbs. tot. 1 Stream 2,646 lbs. tot. 1 Keedge 1,323 lbs. tot. Chain: Length 1,968'-2 3/4" dia. 1 steel hawser 788'-7 1/4" circ. 1 steel hawser 788'-5 3/8" circ. 2 steel hawsers 788'-2 3/8" circ.	
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Complement

Deck officers	15
Deck crew	52
Engineer officers	16
Engineer crew	32
Purser's and steward's department	280
Total officers and crew	405
First-class passengers	280
Second-class passengers	340
Third-class passengers	960
Total passengers	1,580
Total complement	1,985

Handling Equipment

No.	Type	Capacity	Length
Masts 4	—	—	140'
Booms 23	—	—	—
Discharging capacity	—	5 tons	—

Deck Machinery

(Number, Size, Type)

Steering gear, 1 electric driven.
Windlass, 1 steam driven.
Capstans, 2 steam driven forward, 2 electric driven aft.
Winches, 2 steam driven, 2 electric driven.
Boat winches, 2 steam driven.

Life Saving Equipment

Lifeboats	No.	Type	Length
Motorboats	2	—	28'
Lifeboats	14	—	30'
Lifeboats	10	—	28'
Lifeboats	2	—	26'
Working boats	2	—	22'
Total	30		

Propelling Machinery
Boilers

Number	4 double, 4 single
Type	Scotch
Length	D. E. 21' 2 3/4", S. E. 10' 7 1/2"
Diameter	15' 3 1/4"
Furnaces	D. E. 6, S. E. 3
Fuel	Oil
Draft	Howden forced
Total heating surface, square feet	32,300
Total grate surface or furnace volume	1150/1250
Superheat, degrees F	302°
Working pressure, lbs. per sq. in.	213
Normal fuel consumption:	
Per day, tons	130 oil
Normal steam production:	
Per hour per pound of fuel	13 lbs.
Total per hour	155,000 lbs.

Engines

Number	Two 4-stage sets
Type	Gear turbine
Horsepower	13,000 I. H. P.

Propellers

Number	Two
Type	Built up
Diameter	17' 0 3/4"
Pitch	17' 0 3/4"

Auxiliary Machinery

(Number, Size, Type)

Machinery Space:	
Condensers	2—Surface, 6,458 sq. ft. each
Evaporators	2
Distiller	1
Filters	1
Feed water heater	1
Fuel oil heaters	4
Pumps:	
Circulating pump	2
Steam jet pump	4
Centrifugal condensate pump	4
Simplex feed water pump	2
Centrifugal feed water pump	2
Auxiliary condensate pump	1
Ballast pump	2
Sanitary pump	1
Simplex steam pump	2
Oil feed pump	2
Simplex mud pump	1

Refrigerating Machinery:	
1 set duplex	200,000 cal. metric.
1 set simplex	17,500 cal. metric.

Electric Equipment:

Generators, 3 sets of 220 K.W.
Radio, 1 main, 1 spare station.
Emergency, 2 sets of 25 K.W.

Holds

No.	Length	Hatches
1	56'	22' x 18'
2	47' 6"	25' x 18'
3	49'	27' x 18'

4	44'	24' 6" x 18'
5	30'	27' x 18'
6	49'	27' x 18'
7	49' 6"	16' x 18'

Capacities

Cargo Space

Compartment:	Grain	Bales
Hold No. 1	42,031	35,850
Hold No. 2	56,547	51,602
Hold No. 3	65,590	60,150
Hold No. 4	57,006	52,308
Hold No. 5	30,269	26,878
Hold No. 6	40,265	36,687
Hold No. 7	29,422	26,595
2nd 'tween deck No. 1	19,072	16,706
2nd 'tween deck No. 2	25,182	22,322
2nd 'tween deck No. 4	25,818	22,569
2nd 'tween deck No. 6	41,288	38,253
1st 'tween deck No. 3	24,796	24,795
1st 'tween deck No. 4	33,074	35,250

Refrigerated Space

Compartment:	Cu. Ft.
Cargo	16,531
Ice	1,236
Beer	2,579
Cheese, eggs, butter	1,766
Ham	424
Meat	3,602
Fish	635
Poultry	883
Vegetables	3,038

Fuel Oil Bunkers

Compartment:	Cu. Ft.
Cross bunkers	96,350
Coal bunker for galleys	3,420

Double Bottom Tanks

Compartment:	Cu. Ft.	Fuel Oil
No. 1	5,355	
No. 2	6,910	
No. 3	9,650	
No. 4	9,305	
No. 5	5,510	
No. 6	19,700	
No. 7	9,280	
No. 8	11,660	
No. 9	9,395	
No. 10	4,445	
Total	91,210	

Peak Tanks and Deep Tanks

	Cu. Ft.	S. V.
Fore peak	5,690	
Aft peak	8,050	
Deep tanks on d. b.	25,730	
Deep tanks on tw. deck	12,500	

Siemens Martin steel, and conforms to all the rules prescribed by the American, British and German laws for this class and type of vessels, carrying passengers of three classes including emigrants.

With respect to safety appliances, including bulkheads and boats, the vessel is built and equipped according to the rules and recommendations laid down as a result of the *Titanic* conference for the protection of human life at sea.

PRINCIPAL DIMENSIONS

Length over all	627 feet 1 5/8 inches
Length between perpendiculars	599 feet 10 15/16 inches
Beam over inner frames	72 feet 9 inches
Beam over frames of bulges	78 feet 8 5/8 inches
Depth molded to first deck	55 feet 6 inches
Maximum draft	32 feet 7 13/16 inches
Carrying capacity, deadweight	12,796 Eng. Tons
Engine power	13,000 I. H. P.
Designed average speed	16 knots

The double bottom, representing a space of 2,300 tons, is used for fresh feed and ballast water in the usual way and for only 600 tons of spare oil fuel, the latter being principally carried in deep tanks above the tank top.

Outside of the double bottom feed and fresh water tanks of 1,000 tons capacity are provided.

The bunkers for oil fuel were carefully designed to pre-

vent leakages by deformation, caused by the bending stresses imposed by the waves. They have a net capacity for 2,730 tons of oil.

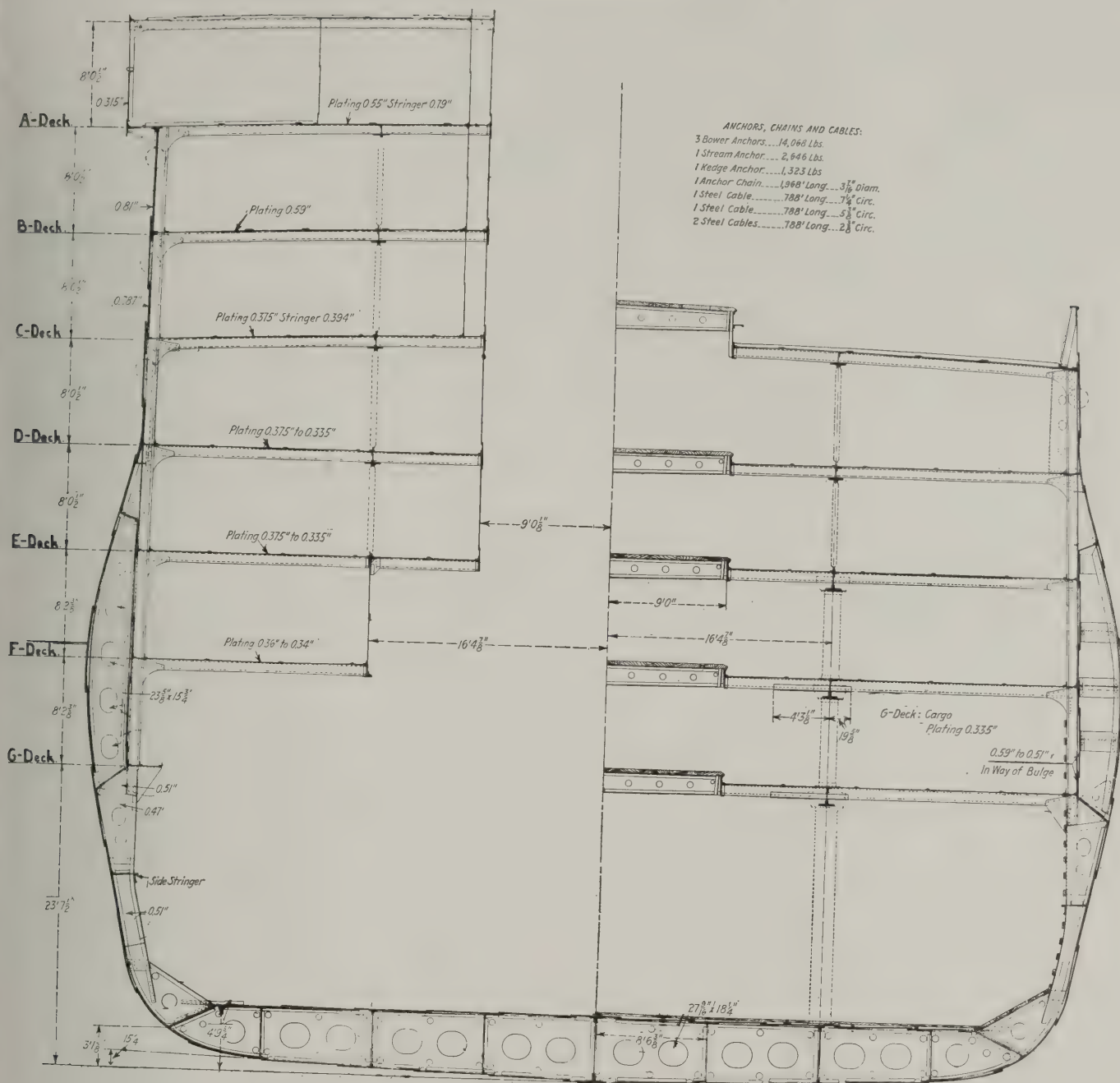
The cargo space contains 449,975 cubic feet measured to the lower edge of beams, the inner edge of frames and the tank top ceiling. In this figure, the refrigerated spaces of 3,038 cubic feet and miscellaneous spaces for provisions, paint, etc., of 3,815 cubic feet are not included. The plans show the general distribution of the space.

PASSENGER ACCOMMODATIONS

Amidships the vessel is arranged for the accommodation of the first class passengers. The second and third classes are distributed in the ends of the vessel as shown on the plans.

The total number of passengers that can be accommodated is as follows: First class, 127 cabins with 215 normal berths, 36 sofa-berths, 23 spare berths; second class, 103 cabins with 216 normal berths, 124 sofa-berths; third class, 186 cabins with 645 normal berths, 315 berths in compartments.

The first class has a dining saloon with 238 seats, a hall with 64 seats, ladies' saloon with 29 seats, smoking saloon with 100 seats, grill room with 36 seats, children's playroom with 22 seats, two deck-verandahs with 98 seats.



S. S. Albert Ballin: Midship Section

The second class has a dining saloon with 214 seats, a hall with 65 seats, smoking saloon with 72 seats, ladies' saloon with 76 seats and a deck-verandah.

The third class has a dining saloon with 345 seats, smoking saloon with 70 seats and ladies' saloon with 70 seats.

STEERING AND NAVIGATING APPLIANCES

The partly balanced rudder has been designed as a one plate rudder supported by welded arms. The rudder quadrant is installed on G deck. The steering engine is electrically driven. Two equal units are provided, one of them performing the service, the other being in reserve.

The Anschütz gyroscope compass combined with the self-steerer has been installed, enabling the vessel to be steered on a given course by the compass without a helmsman. This new principle, one of the most sensational inventions in shipping, is based upon the automatic work of a small motor in the compass box, which is controlled by the compass—this latter making the contacts for the working of the motor in

the one or the other direction. This motor is connected to the axis of the hand wheel of the telemotor by a Gall chain. The vessel has powerful submarine signalling and wireless installations, whose power is secured by an emergency motor generator in case of damage to the main engine or boiler plant.

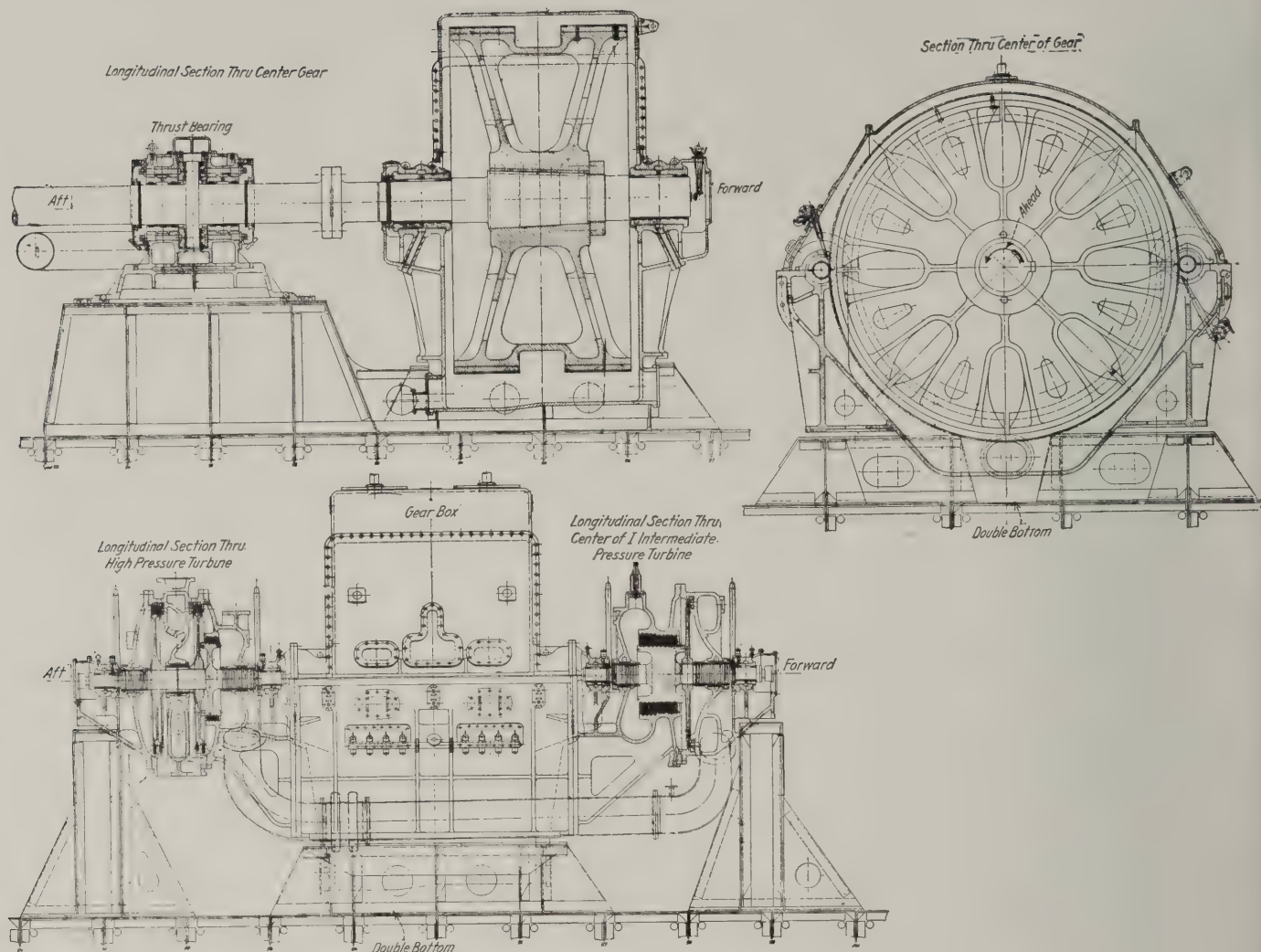
There are four vertical steel masts and seven hatches, worked by twenty-one 5-ton Mannesmann-derricks and twenty-one steam winches. The provision hatches are worked by electric winches.

APPLIANCES FOR SAFETY AND LIFE SAVING

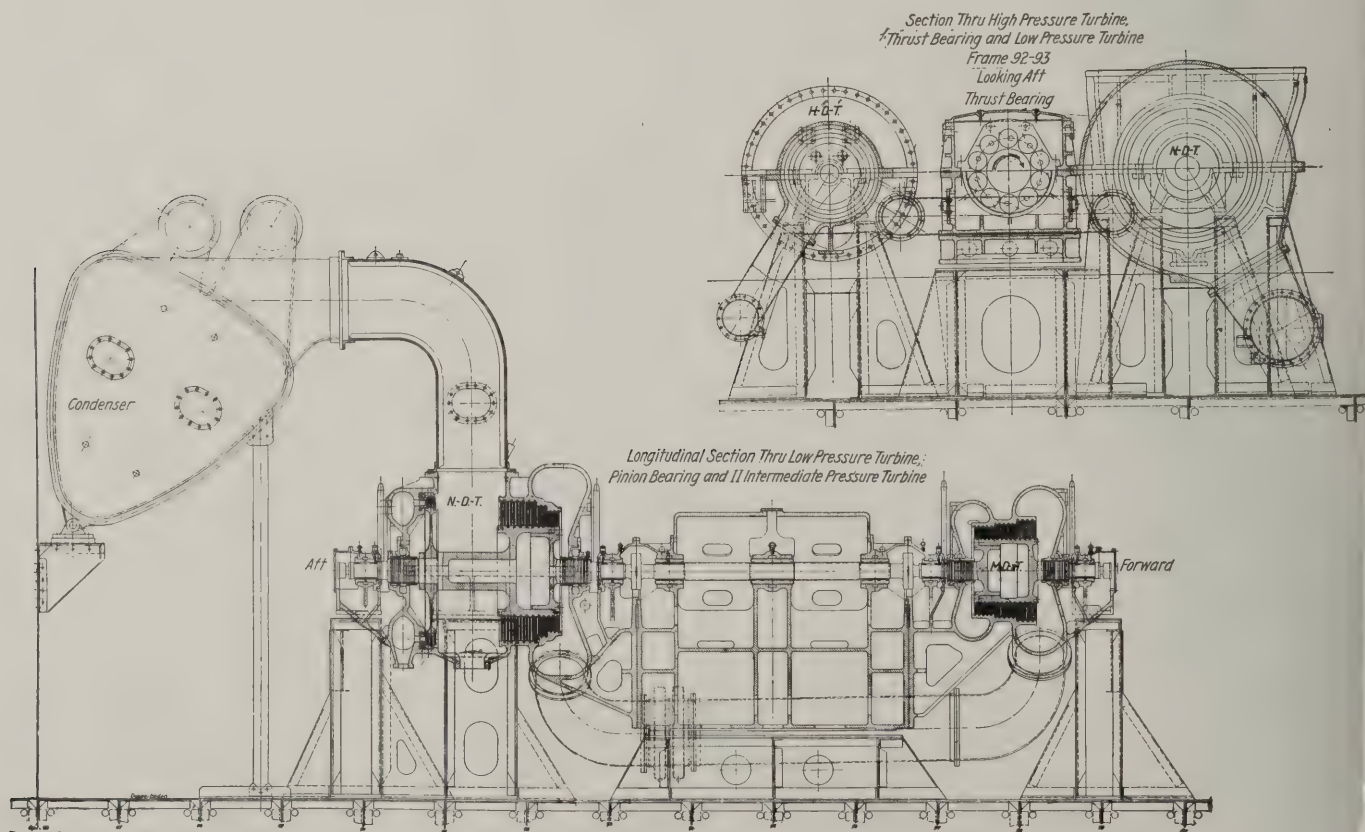
The vessel has 13 watertight bulkheads, which have no interruption whatever from the tank top up to the bulkhead deck.

The double bottom is raised at the sides in order better to cover the bilges.

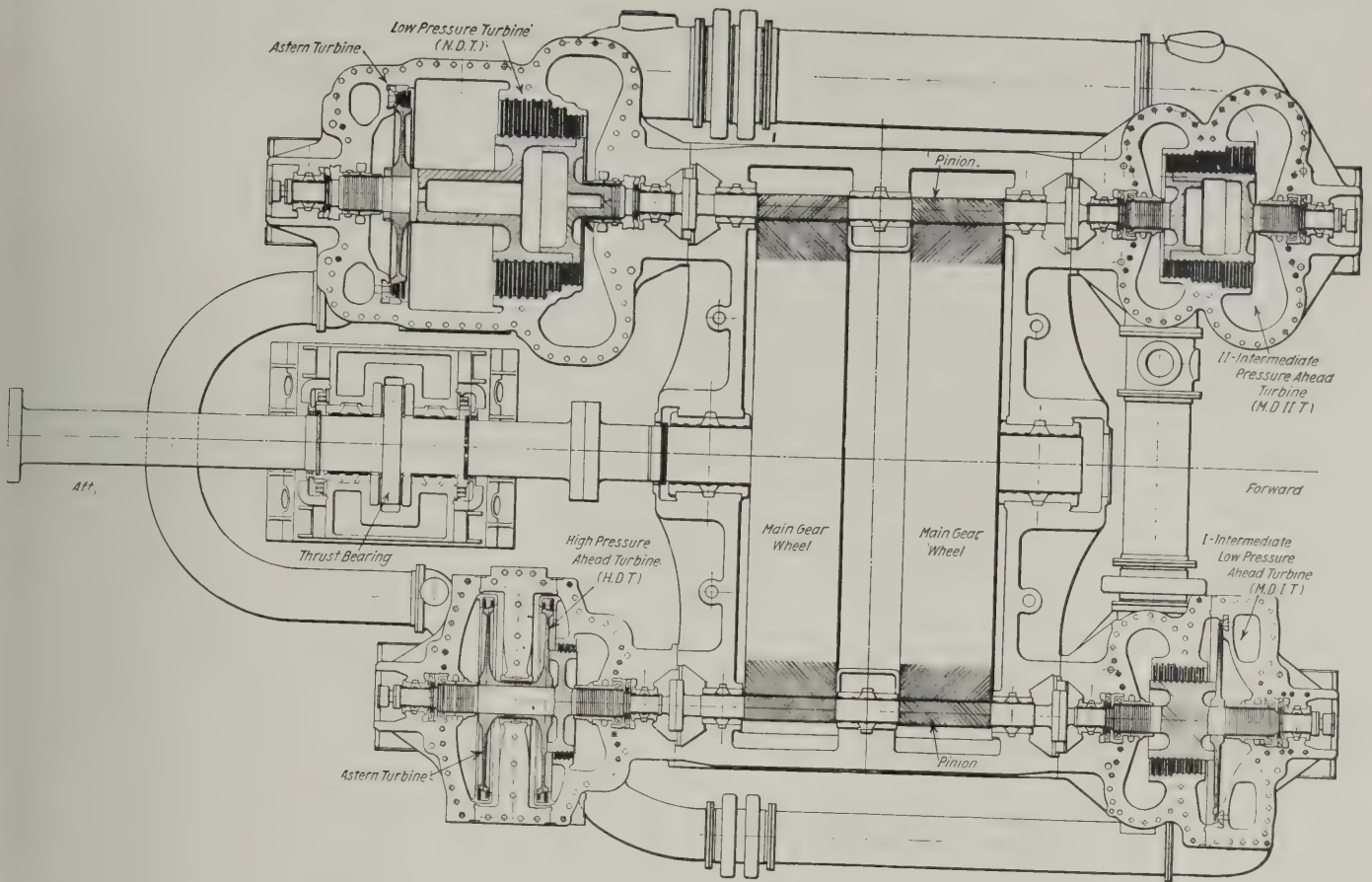
The necessary openings in the bulkheads in the range of the engine and boiler plant are worked by an elaborate



Details of Reduction Gear



Sections Through One of the Propelling Units



Arrangement of Port Set of Four Ahead and Two Astern Turbines. Starboard Side Similar

hydraulic-pneumatic system developed and executed by the Atlas Works.

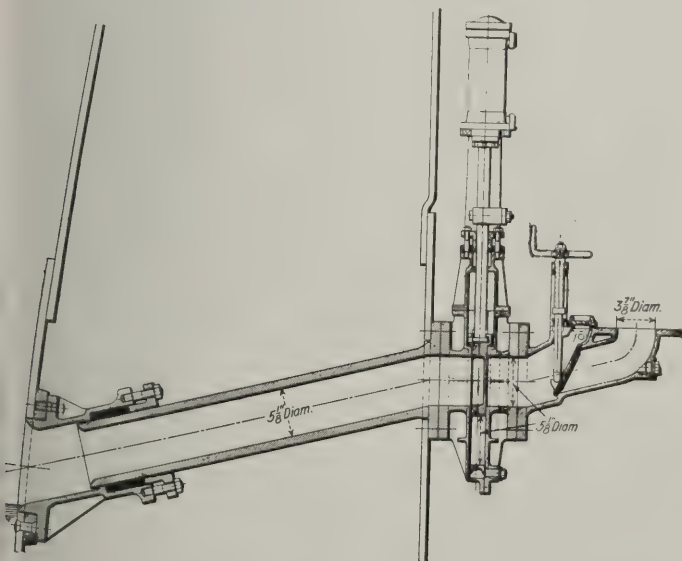
A further remarkable safety feature is the hydraulic-pneumatic system for closing the main scuppers after a collision, as these come below the water level. The illustration of this arrangement shows the principle of this important addition to safety, which excludes any water that may run into the vessel through scuppers below the bulkhead deck.

The number and size of lifeboats have been adjusted to the maximum number of passengers and crew on board.

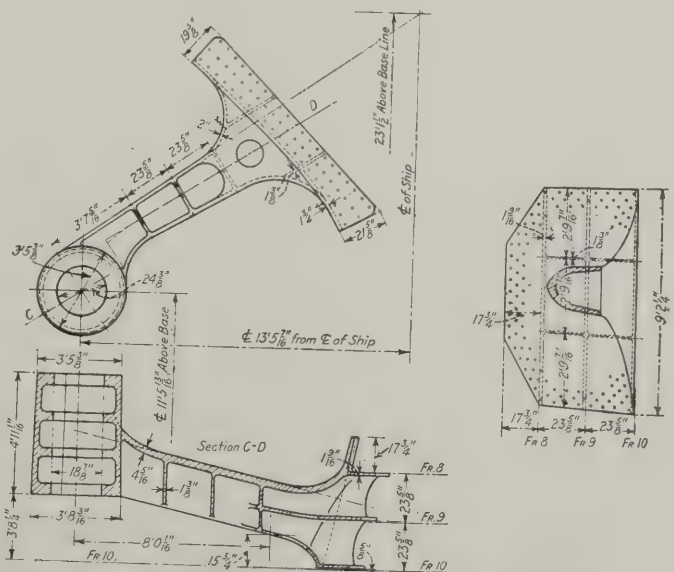
All boats are placed under Welin quadrant davits. There are 28 normal lifeboats, diagonally built of oak, two of them being motorboats.

THE MAIN ENGINES

The main engines are two turbine plants of equal size, independent of each other but symmetrically arranged. Each set consists of four ahead turbines, and two astern turbines, driving one propeller by means of a single reduction gear through one large wheel gearing with two small pinions. The ahead turbine sets are composed of four cylinders. The pinion placed amidship is set in motion at its aft end by



New System Installed for Preventing Water Coming in Through Toilets and Washrooms In Case Vessel Sinks to Deeper Draft After Collision



Shaft Strut

the high pressure turbine, H.D.T. and at its forward end by the first intermediate pressure turbine M.D.I.T. The pinion next to the ship side, at its fore end by the second intermediate pressure turbine M.D.II.T. and at its aft end by the low pressure turbine N.D.T.

The principal advantage of this arrangement consists in subjecting the pinion to equal torsional strain from either side, to prevent a twisting inside the length of the pinion and to warrant an equal pressure on the tooth face. Further, this arrangement of the turbines avoids axial-thrust and balance-pistons inside the turbines. Therefore no thrust

parts, the second medium pressure turbine M.D.II.T. and the low pressure turbine N.D.T. are of pure reaction type.

The total power of the two turbine sets is 12,000 effective horsepower at about 2,100 revolutions. The astern turbines develop two-thirds of this amount, corresponding to the lower efficiency of the propeller blades.

Running astern, the inner pinion is driven by the high-pressure astern turbine H.D.R.T., the outer pinion by the low pressure astern turbine N.D.R.T., placed at the aft end of the pinion shafts. Both astern turbines are in the same casings as the corresponding ahead turbines. To avoid axial thrust of the astern turbines, they are designed as pure action-wheels with two rows of blades.

The two pinions of equal size engage with the large wheel, transferring the power to the propeller by the tunnel shafting. The propeller thrust is taken up by Michell thrust blocks, fastened to strong frames and foundations. The thrust block consists of a single thrust ring on the thrust shaft and the movable pads, 10 for going ahead and 10 for astern, each pad being adjustable by a separate set screw.

PROPELLERS

The two built-up propellers of 17 feet $0\frac{3}{4}$ -inch diameter and 17 feet $0\frac{3}{4}$ -inch pitch are composed of four bronze blades and cast iron bosses fitted with steel junk-rings. The two stern tubes are lined in the usual manner with lignum vitæ bushes.

The shafting is supported by 16 bearings, automatically lubricated by an oil circulating system. A thorough and copious supply of lubricating oil is essential for good working of the turbines. One duplex steam pump brings the oil up through a strainer to an elevated tank. From there it is distributed to all oil supplies, and flows back into a tank in the double bottom. Therefore all turbine, gear and thrust block bearings are supplied with oil of constant and uniform pressure. The gear's teeth get the oil over the whole width by distributing jets. The flow of oil and its temperature are under permanent control. To warrant sufficient lubrication of the whole plant before starting, an automatic valve is provided to shut off the main steam pipe, only allowing the steam to pass, when full oil pressure has been reached. It is designed as a double beat valve to be closed by a spring and counter-balanced by a piston, lifted by the pressure in the oil supply pipe. Should this pressure be diminished by any reason, the spring shuts the valve, cutting off the steam from the turbine.

In a similar way an explosion of the turbine-wheels, caused by a broken pinion shaft, is prevented by an emergency governor, placed at the end of each turbine shaft and set to act at a certain number of revolutions.

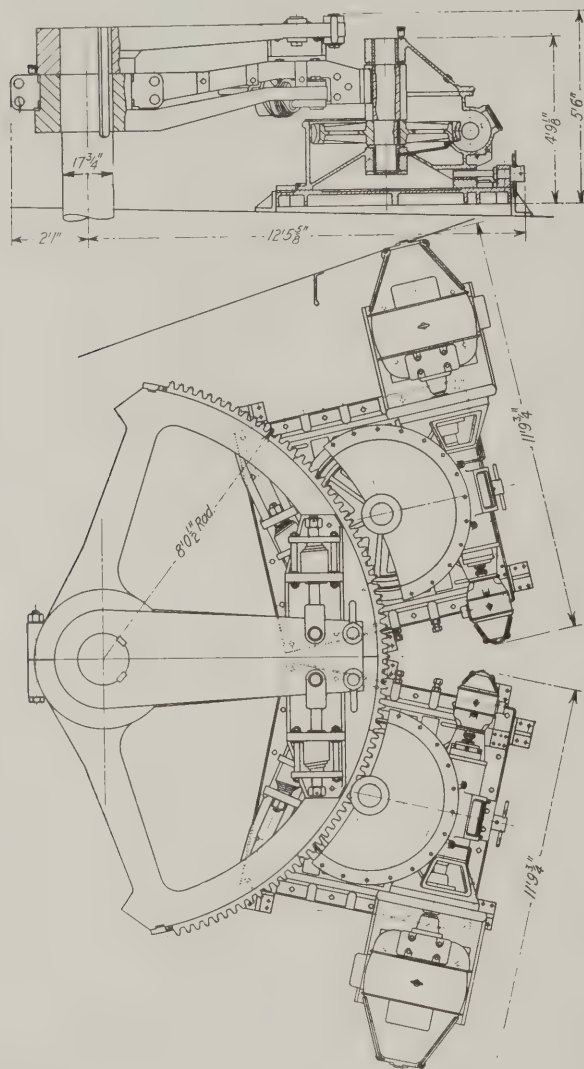
The ends of the turbines are made steam and air tight by labyrinth packings, consisting of solid dummy rings of soft metal, fastened in the stuffing box gland and the turbine spindle.

Running the plant ahead or astern, the stuffing boxes must be tight against pressures higher or lower than the atmosphere. Thus, in the first case, the escaping steam is led to the condenser by a suction pipe, while in case of vacuum, throttled steam may enter the stuffing box, preventing air leakage to the turbine.

The whole turbine set is controlled by two hand wheels, arranged on one table near the maneuvering platform together with revolution counters and manometers.

Special lifting arrangements, consisting of trolleys and pulley blocks are provided, affording an easy and accurate means of lifting and dismounting of casings and drums when required.

In order to obtain the shortest possible piping leads, the pumps and auxiliaries for engine and ship's service are placed together in groups. There are seven groups of machinery:



Steering Gear

bearings are provided, as the gearing itself, being right-handed and left-handed, fixes the position of the entire shaft.

The division of the turbine in four stages affords a very high steam efficiency, in spite of the relatively slow running turbines. Therefore a single reduction gear of 1:20 is sufficient to bring down the revolutions of the propeller to 110 per minute. By this system of gearing the difficult problem of combining turbine plant of high economy and small weight with an efficient propeller of low peripheral velocity has been solved.

By dividing the turbine, the heat stresses are reduced to a minimum, allowing tightness of flanges, dummy-rings and stuffing-boxes, which are of extraordinary small size, compared with the power developed. Better reliability and an easy overhaul of the plant are further advantages obtained. The high pressure turbine H.D.T. and the first medium pressure turbine M.D.I.T. consists of action and reaction

1. Condensing plant under the condensers at the aft engine room bulkhead.
2. Boiler feed plant at the forward engine room bulkhead between main engine plant and boiler room.
3. Pumps and apparatus for ship's service on either side of the engine room.
4. Refrigerating plant at the forward end of the tunnel next to the refrigerating rooms.
5. Appliances for fuel oil service at the forward boiler room bulkhead.
6. Electrical plant above the condensers.
7. Tanks and distribution boxes and branches in the engine room hatch and dummy funnel.

CONDENSERS

The aft condensers of pear-shaped section with a cooling surface of 6,458 square feet each, are placed athwartships, supported by the aft bulkhead of the engine room. The condenser tubes are of brass with an external diameter of $\frac{3}{4}$ inch and a thickness of 0.059 inch, the upper rows having a thickness of 0.079 inch.

Two circulating pumps with a capacity of 2,400 tons per hour at 250 revolutions per minute get their water from either side. The sea valves are fitted to the ship side close to the pumps, the cooling water pipes, therefore, are extremely short and handy. The cooling water is discharged above the condensers so that they will always be filled with water.

The air and condensate pumps are put underneath the condensers, in order to have short connecting piping.

Instead of the usual piston pumps for drawing off both air and water, the condensing plant is fitted with steam jet air pumps and centrifugal condensate pumps. This kind of condenser auxiliaries began to replace the piston pumps on board turbine ships during the past few years on account of the excellent results obtainable from steam jet air pumps on shore. On board of all ships, fitted with such pumps, all due expectations have been realized.

The steam jet air pumps are of the two stage type in combination with an intermediate condenser for condensing the working steam of the first stage, the second stage having only to draw off pure air. The exhaust steam of the second stage is condensed by a similar surface condenser. The condensate of the main condenser acts in both as cooling water, absorbing the latent heat of all the live steam. Only this new construction makes the system reliable and economical.

For each of the two condensers, there is installed a steam jet air pump having a steam consumption of 1,367 pounds per hour and, as spare, with a second one of 683.5 pounds per hour. Both pumps are fastened upon the intermediate condenser, and designed for a normal working pressure of 118 pounds per square inch, the large pump being able to draw off 103.6 pounds of air at 95 percent vacuum.

To allow sufficient low suction, a vertical design of centrifugal condensate pump was decided upon. The shaft is driven by a steam turbine, designed as an action turbine with two velocity stages. The rotor is fastened at the upper end of the shaft and the impeller of the centrifugal pump at the lower end. Both wheels are of the overhung type.

PUMP DATA

Capacity	64.4 tons per hour
Manometric head (including vacuum head)	75.5 feet
Revolutions per minute	250
Power absorbed	11 horsepower

TURBINES

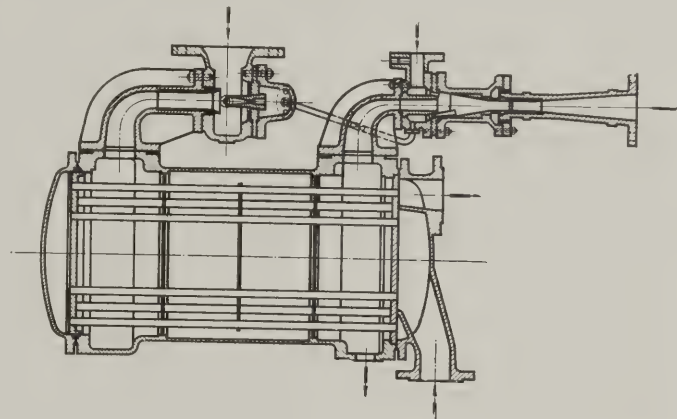
Normal power	13 horsepower
Steam pressure	220.5 pounds per square inch
Temperature of steam	432 degrees F.
Back pressure	29.4 pounds per square inch

The condensate out of the main condensers is pumped into an elevated hot well fixed to the forward engine room bulk-

head. From there, the feed water flows down to the feed pumps.

FEED PUMPS

Two simplex pumps, constructed by Georg Niemeyer, Harburg-Elbe, and two turbine centrifugal pumps, by the A. E. G., Berlin, feed the boilers. To aid the suction to the centrifugal pumps, the feed water tank has been elevated. The shaft of the pump is supported by two oil ring bearings, the rotor of the turbine being fixed to the middle and the impeller on one end. The turbine casing and bearings are horizontally divided, giving easy access to the inner parts of the turbine and the bearings, after lifting the cylinder cover and bearing caps. The pedestals and lower parts of the casing are a solid casting, one end being flanged for fastening the pumps. The steam chest, with the by-pass valves, the nozzle block and the distributor are fastened to the turbine cover. The inlet connecting branch supports, the stop and throttle valve are combined in one casing. The first, being formed as safety shut off valve, may be closed by hand or governor. It is automatically put in action to prevent racing of the turbine when a pipe fracture occurs. The throttle valve, being controlled by regulating apparatus,



Steam Injector Pump for Auxiliary Condenser

regulates the output of the pump, corresponding to the necessary amount of water, by adapting the steam admission of the turbine to the pump's want of power. The suction pipe is flanged to an axial inlet connecting branch, while the tangential pressure connecting branch joins horizontally.

The turbine is constructed as a one stage action turbine, partially admissioned, with three velocity stages. It is fitted with nozzles, to be run as a non-condensing engine.

A feed water heater of 753 square feet heating surface raises the feed water temperature to 248 degrees Fahrenheit.

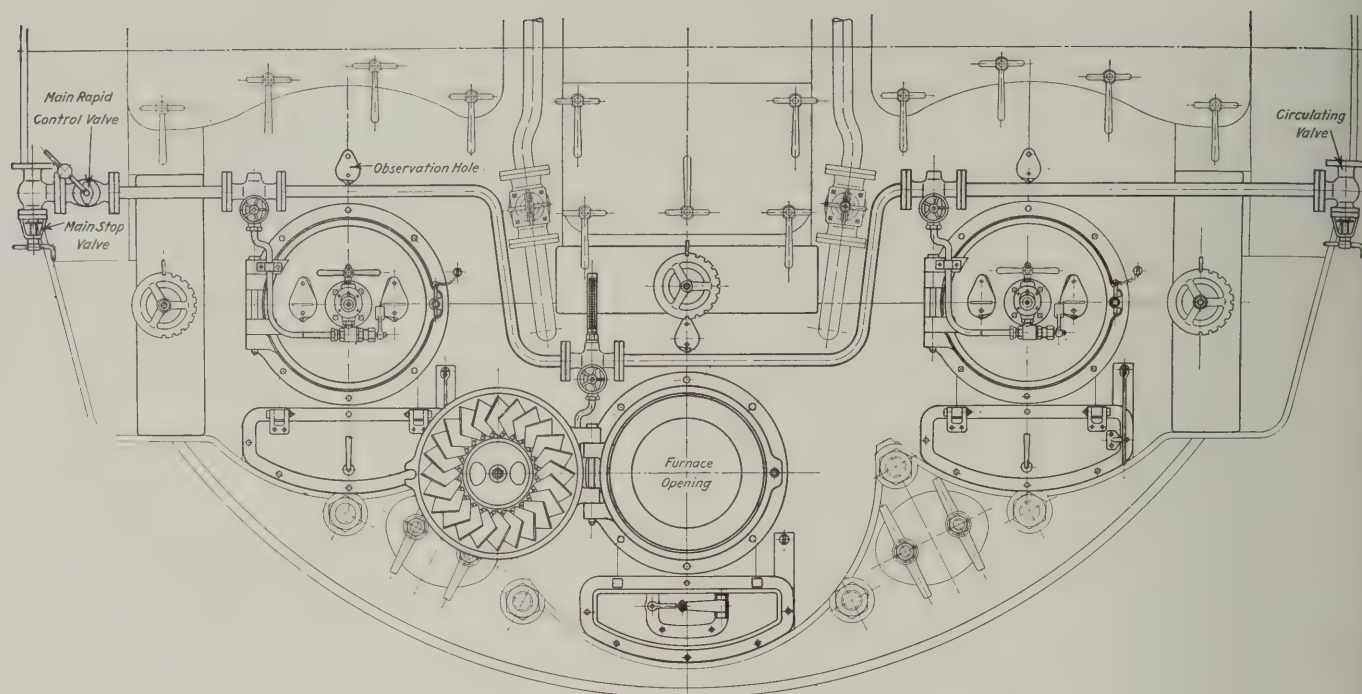
The auxiliary condensing plant is installed at the port side of the engine room. It consists of one circular shaped auxiliary condenser with 753 square feet of condensing surface, one simplex air pump and one circulating pump. The auxiliary condenser takes up the exhaust steam of the auxiliary engine, turbo generator, refrigerating machinery, winches, heating piping and galley apparatus. Several pumps for ship's service are installed at the same side of engine room.

EVAPORATOR

At the starboard side of the engine room, there is arranged a vacuum exhaust steam evaporator.

Other auxiliaries in the engine room comprise pumps and apparatus for oil service of the main turbines, for double bottom and bilge service, water supply to passenger accommodation and galleys.

The refrigerating plant is placed aft of the engine room



Arrangement of Oil Burners

and is composed of one double acting engine with a capacity of 200,000 kilogram-calories and a small one of 17,500, together with the necessary apparatus. Besides there are installed pumps and tanks for operating the watertight doors, an interesting innovation being the vertical differential pressure pump. Further aft, two sand filters and two simplex drinking water pumps are arranged.

BOILER PLANT

The boiler plant consists of four single ended and four double ended Scotch boilers, fitted with steam superheaters,

the heating surface of the boilers amounting to 32,300 square feet. The single ended boiler has three and the double ended boiler, six furnaces of the Morison type, of about 3 feet 9 $\frac{3}{8}$ inches diameter, the working pressure being 213 pounds per square inch. The superheaters, constructed as return pipes inside the smoke tubes, raise the steam temperature up to 662 degrees Fahrenheit. The uptakes of all boilers join together in one funnel.

Two fans, driven by steam engines and producing compressed air for the furnaces, are put above the bulkhead between the engine and boiler rooms, in order to draw off the hot air rising from valves, pipings and fittings on the bulkhead.

It may be mentioned that small steam turbines, to be started from the working passage, are provided for shutting off the boiler main stop valves in case of necessity.

The boilers are fitted with the Blohm & Voss oil burning system which affords economical and efficient combustion. The oil, atomized by the burners, goes into the furnace in the form of a conical spray. The burners are surrounded by a double ring of guide blades, in order to direct the air, coming from the blowing engine, tangentially into the oil cone, thus causing a quick rotating flame. By this method a perfect mixing of oxygen and oil particles is performed, producing ideal combustion, and at the same time preventing local superheating of the furnace.

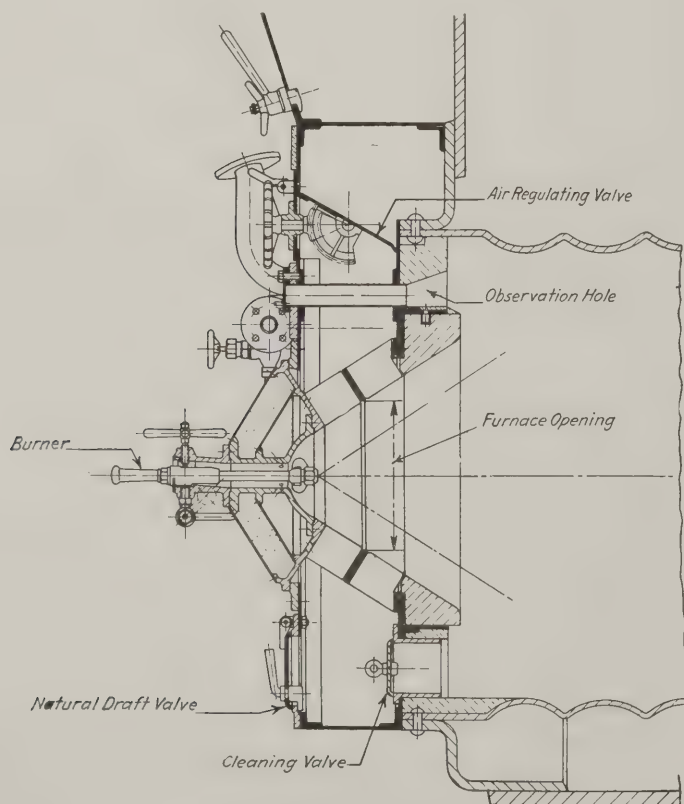
The air blades are of different design, the first ring guiding the air to the outer zone of the oil cone, the second ring of blades being directed nearer to the cone's axis. Thus, even at the highest burner capacity of 529 pounds per hour, no unburnt oil particles will hit the furnace wall. Therefore, settling of coke inside the furnace, the principal drawback of many oil burning systems, is prevented, the boiler plant being adapted for the most trying conditions of oil quality and service.

In order to give an easy access to the furnaces and furnace chambers, it is possible to swing out the inner blade ring.

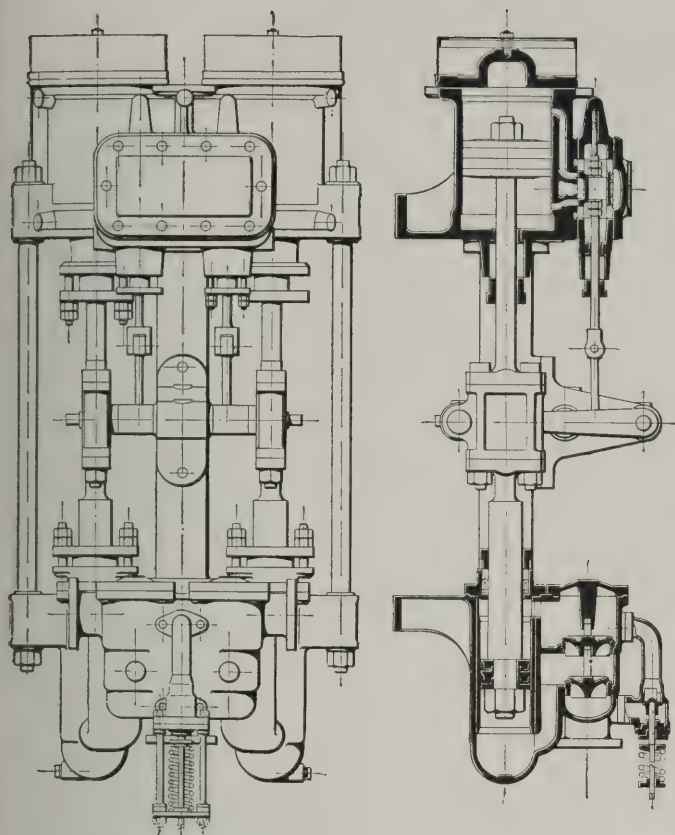
To prevent unequal heating or cooling of the furnace, inside brickwork is avoided everywhere.

OIL BUNKERING SYSTEM

To take oil on board, two filling stations with filters and control tanks have been installed. The oil flows from there

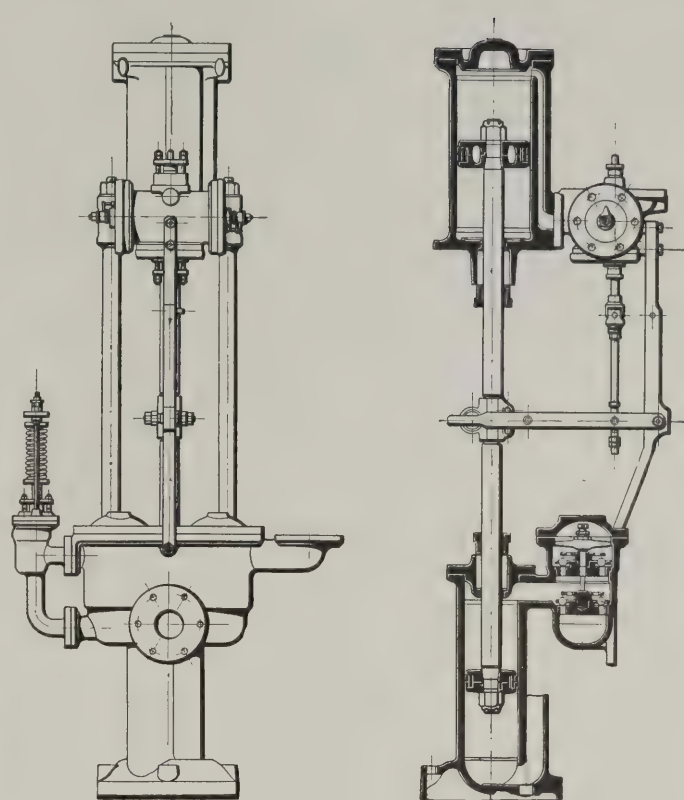


Section Through Oil Burning Furnace



Main Pump for Hydraulically Closing Doors in Watertight Bulkheads

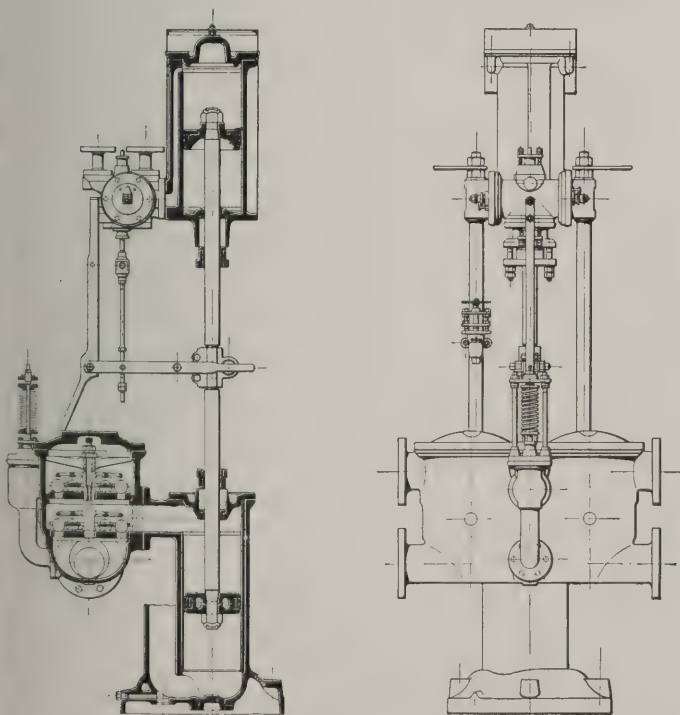
into the oil tanks through the filling and circulating pipe, preventing excessive pressure or high temperature in the oil tanks caused by filling. A special reserve tank takes up the surplus of oil by means of an overflow pipe. Moreover this overflow pipe is used as a vent pipe, having its outlet at the top of the fore funnel. A simplex steam pump transfers the oil from the tanks on one side of the ship to those



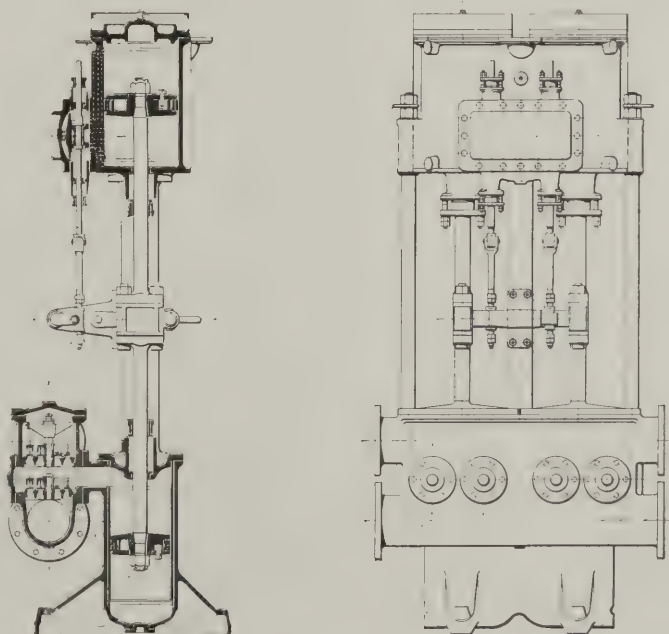
Main Pump for the Fuel Oil

on the other side or to the settling tanks, which separate water from the oil before using it. From there the oil is drawn off by an oil feed pump through an interchangeable duplex suction strainer and then forced into the burner supply pipe through a steam oil heater and an interchangeable duplex discharge strainer. By the heaters, the oil temperature is raised up to 248 degrees Fahrenheit. The burner supply valve by-passes the surplus oil to the settling tanks or to the suction pipe. The piping is fitted with air receiver, to ensure uniform pressure in the burner tips. A second complete oil feed plant is installed as a stand-by.

The amount of oil in the bunkers, settling tanks and over-



Oil Fuel Pump



Lubricating Oil Pump

flow tanks is indicated by means of pneumercators, which show the height of the oil levels.

All pumps and apparatus for oil burning service are arranged together at the fore boiler room bulkhead, to ensure simple and easy handling.

SERVICE AND FIRE PUMPS

The deck wash and fire extinguishing pipes starting from the main distributing branch in the engine room are led as main lines inside the engine and boiler room hatches and from there in two lines through the whole ship.

Cold sea water is provided for all baths, toilets, lavatories and galley, cold fresh water for all first class wash stands, galleys, suite-de-luxe and hospital baths, and on each deck at many tapping points. Warm sea and fresh water is provided through circulating piping, having heaters in the engine room and tanks in the dummy-funnel. Warm sea water is led to all baths, toilets and lavatories, while warm fresh water is only provided for the wash stands of the suites-de-luxe, first class barber shop, and hospital baths.

The main stop valves for sea and fresh water piping are placed in the engine room hatch; there each deck may be shut off separately.

VENTILATION

First class inside cabins, all second class cabins, as well as crew accommodations get artificial ventilation, while in the third class, the gangways only are ventilated. Suction of air is fitted from all baths and lavatories. Artificial ventilation is also provided for galleys, provision and refrigerating rooms. Saloons, dining and smoking rooms receive an ample supply of fresh air; 21 discharge and 19 suction fans with electrical motors are arranged on deck or in special rooms. Five more fresh air fans are installed for ventilating the engine rooms and both stokeholes.

HEATING

Live steam, taken from the auxiliary steam piping, is throttled down to 59 pounds per square inch pressure for deck heating, and to 44 pounds per square inch for galley purposes.

Two main steam distributing branches are fastened in the engine room hatch, the heating branch being divided in such a way as to allow separate control of heating for crew and passenger rooms and baths. The different positions in each deck are under separate control by special distributing branches, the exhaust piping being similarly constructed. To prevent water hammering, the exhaust steam piping is inclined towards the engine room.

Copper coils, to be shut off at the steam inlet and outlet, are used as heaters in the cabins, supply and exhaust pipes being laid behind paneling.

THE ELECTRICAL EQUIPMENT

The main generating equipment consists of three 220 kilowatt turbine driven generators and the emergency equipment of two 25 kilowatt oil motor driven generators. All generators are direct current with a terminal voltage of 115 volts. The three turbine driven generators are connected in parallel to the same bus bars, but generally only two are running and the third is principally for stand-by service.

On the ship nearly all auxiliary machines are driven by electric motors. Consequently it was necessary to insure non-failure of bus bar voltage under all circumstances. This was taken care of by the patent of Carl Meyer, which properly equalizes the load even though one of the generators should unexpectedly cease to function.

The switchboard in the emergency dynamo room may be fed as well by the turbine driven generator as by the oil motor driven emergency generators. On this switchboard are the circuits for the emergency lighting plant, for the emergency

equipment of the steering engine, the wireless plant, the position lights, the Anschütz gyrocompass, the alarm and telegraph installation. The two oil motor driven generators also run in parallel, but on a separate system from that of the turbine driven generators.

AUXILIARY POWER PLANT

The power plant consists of 104 motors having a combined horsepower of 900. Electric drive is used for the steering engine, the warping winches, the elevators, the ventilators, the pumps, the cargo winches and kitchen machinery. Only the specially built type of the electric driven steering gear will be described.

The rudder quadrant is driven by means of a self-locking worm by two steering engines, equal in size and fully independent, each driven by a separate electric motor. One of these two driving mechanisms is for stand-by service and the driving wheel of this machinery is not engaging with the toothed worm gear. In the steering engine room one change-over switch is provided for each of the two steering engines to connect them either with the steering wheel on the bridge or with the emergency steering wheel. In the first case the steering engine is driven by one motor generator by the Leonard system and in the second case by one normal tension switch with constant voltage and half slowed down speed. For working with the Leonard system two motor generators are arranged in the main generating station, one for stand-by service. Each of the two motor generators is connected with a steering lever on the bridge. The rudder motor turns back this steering lever to its starting point by electric synchronous transmission which is constructed according to our own patent system and replaces the old fashioned mechanical transmission.

ELECTRIC FANS

The electric ventilating system is worth mentioning. The fan motors are started from one central switchboard in the main generating station by electric transmission turning the levers of the self-acting starters beside the motors. The speed of the fans is controlled from the same central switchboard.

ELECTRIC HEATING

Electric heating in addition to steam is used for the first class passenger cabins. This circuit is separated from the electric heating, of several heating plates in the saloons, of the hot water boilers in the pantry and of baking ovens and toasters.

LIGHTING

The lighting plant is divided in all-day burning lamps, in switchable lamps and emergency lighting. The current for the distributing stations of the all-day burning and switchable lamps is conducted from the main switchboard by separate cables. The distributing stations for the emergency lighting are connected with the emergency switchboard, which is direct connected with the main switchboard but, if this connection is switched off, it gets the current from the emergency generators. The 600 lamps of the emergency lighting are distributed all over the ship, including all lamps of the engine and boiler rooms.

LLOYD'S SHIPBUILDING REPORT.—The decline in world shipbuilding has now reached new low levels, both in respect to orders placed and work actually under way, says a statement just issued by Lloyd's Register of Shipping, giving returns for the quarter ended June 30. While a gain was shown in the first quarter of this year in the work on which construction was progressing that gain was eliminated in the quarter just ended, and all the shipyards of the world have only about two and a half millions gross tons of orders.

Steamship America Becomes Largest Cabin Ship Afloat

Extensive Alterations at New York Navy Yard Convert Vessel Into High Grade One Cabin and Third Class Passenger and Cargo Liner

ON June 2 the steamship *America* of the United States Lines sailed from New York for Plymouth-Cherbourg and Bremen on her first voyage as a one cabin and third class passenger vessel, after being extensively reconditioned at the New York navy yard. The principal alterations were carried out to take care of the increasing demand for good accommodations and service at more moderate rates than those existing for very large first class liners.

This vessel, formerly the *Amerika* of the Hamburg-American Line, built by Harland and Wolff, Belfast, in 1905, was among those vessels seized by the Government after the declaration of war in 1917. After her war service as a troop transport the *America* was placed temporarily in the transatlantic service with accommodations for first, second and third class passengers. The vessel was withdrawn from that service at the first opportunity for general reconditioning and extensive alterations to be converted into a high grade one cabin and third class passenger and cargo vessel, with the result that the *America* is the largest and one of the best cabin ships in service, fully in keeping with the significance of her name.

The reconditioning of the vessel, which was accomplished in 78 consecutive days by the New York navy yard, comprised a complete overhaul of her machinery, the dry docking of the vessel for scraping and painting the hull and extensive changes in the passenger accommodations, some of the most striking of which are described in the following.

MAIN SOCIAL HALL

On "A" deck the space formerly occupied by the first class dining room has been converted to the main social room paneled with contrasting hardwoods in natural finish, chestnut, sycamore and mahogany on walls with chased bronze trimmings applied. The ceilings were painted and decorated in harmonious tints. Casement windows and a skylight covered with ornamental glass and mirrors give sufficient light in daytime, while numerous ceiling lights and wall brackets provide artificial illumination.

A teakwood parquet dancing floor covers about one-third the area of the room, flanked by rich carpet and rugs while rugs are also used on the dancing floor when it is not in use.

Comfortable furniture of mahogany and tapestry of a design to suit the period of the wall decorations has been provided and the effect, while simple, is harmonious and rich.

On this deck twelve new outside staterooms have been built in the space formerly occupied by the auxiliary dining room and men's and women's toilets were built along the centerline in order to increase the passenger accommodations.

Each of the new staterooms is equipped with one four posted bedstead with pullman berth over, one sofa berth with upper berth over, all of mahogany, two wardrobes and two lavatories with running water. The pullman berth, when lowered, rests upon the posts of the bedstead and hence is not dependent upon bulkhead fittings for support when occupied. The sofa berth, when unoccupied, may be made up as a comfortable settee. The whole arrangement has such flexibility that the rooms may be made to comfortably accommodate either one, two, three or four persons. The settees are upholstered to harmonize with the color scheme in these staterooms.

CABIN SMOKING ROOM

One of the features of this ship is the cabin smoking room which extends for two deck heights. The illustrations give an idea of the splendid general appearance of this room, the upper deck being, as shown, in the form of a broad gallery with an open space in the center, allowing light from the skylight overhead to illuminate both decks. This room is representative of a hunting room of an Elizabethan manor house, with solid oak hand carved woodwork.

CABIN DINING ROOM

The space on "D" deck now occupied by the cabin dining room was formerly used as a second class dining room and social hall. This space was completely dismantled and fitted up and equipped as the cabin dining room to accommodate 328 passengers in one sitting. It is about 90 feet long, extends the full width of the vessel, and is located just forward of the main galleys and pantries thereby insuring good service.

The design of the woodwork is Colonial, finished in soft colors. Casement windows conceal the airports without excluding the light. A well has been opened over the center of the room, giving a sense of height and space. Tables for two, four and six persons are used throughout. Handsome electric light fixtures adorn the ceiling and walls and silver candelabra table lamps have been provided for each table. The deck is covered with rubber tile of marble pattern. A

General Data: One Cabin and Third Class Passenger Steamship America

General Information

Office: New York—Plymouth, Cherbourg and Bremen.
Builder: Harland and Wolff, Belfast, Ireland. Reconditioned by New York Navy Yard.
Owner: United States Shipping Board. Operated by United States Lines.

Characteristics

Length, overall 687' 0"
Length, B. P. 669' 0"
Depth, molded 74' 3"
Depth, molded 52' 5 1/2"
Draft, loaded 33' 5 1/2"
Block coefficient 0.729
Speed, loaded, knots 15.9
Turning Transverse
Builder American Bureau of Shipping

Tonnages

(In tons of 2,240 pounds)

Deadweight capacity 12,560
Displacement (loaded) 34,575
Displacement (light) 22,015

(In tons of 100 cubic feet)

Gross register 21,145
Net register 12,257

Complement

Total officers and crew 582
Cabin passengers 692
Third class passengers 1,056
Total passengers 1,748
Total complement 2,330

Life Saving Equipment

50 lifeboats, accommodating 2,587 persons.

Propelling Machinery

Boilers

Number 8-D.E.
Type Scotch
Furnaces 48
Fuel Coal
Draft Howden forced
Total heating surface, square feet 44,000
Total grate surface 1,092
Working pressure, lbs. per sq. in. 210

Engines

Number 2
Type Quadruple expansion
Size 34x49x71x100—63
Horsepower 15,500
Maximum horsepower 17,500

Capacities

Cargo Space

Total bale, cu. ft. 564,549
Total grain, cu. ft. 401,004
Total available space for ship's stores, cu. ft. 113,572

Bunkers

Total capacity *Tons
*45 cu. ft. per ton. 4,555

Tanks

Total fresh water Tons
..... 3,945



Interior Views S. S. America: (1) Upper Smoking Room, (2) Library, (3) Corner of Ladies' Lounge, (4) Fireplace in Smoking Room, (5) Grand Staircase, (6) Lower Smoking Room, (7) Stairway Leading from Lower to Upper Smoking Room



Interior Views of S. S. America: (8) Children's Playroom, (9) Ladies' Lounge, (10) Dining Room, (11) Social Hall, (12) Dancing in the Social Hall, (13) One of the Roomy Staterooms

glass partition at the after end separates the stair lobby from the dining room.

The dining room was designed by Messrs. Walker and Gillette, architects, New York City, who also selected the electric light fixtures and hangings and furnished the color scheme. Messrs. J. C. Knipp and Sons, Baltimore, Md., were the contractors for the woodwork and finish of this room.

GALLEYS AND PANTRIES

After a careful study the galleys and pantries were rearranged and refitted in accordance with the best marine practice and are now so arranged as to give excellent service.

The cabin galleys and pantries are directly aft of the cabin dining room. The third class galleys and pantries have been rearranged and are now adjacent to the cabin galleys and pantries and the third class dining room is directly aft of the third class galleys and pantries.

Particular care has been taken to exclude all woodwork, as far as is practicable, from the galleys and pantries. This detail has been carried out even to table tops and shelving which in most cases are metal.

The third class dining room has been enlarged, altered and refurnished to bring this room strictly up to the United States Line standards and now accommodates 360 passengers in one sitting. The old benches have been removed and comfortable swivel chairs installed.

SUPERSTRUCTURE STIFFENED

Approximately 60 tons of steel were worked into the forward portion of the vessel's superstructure in the form of new deck plating, house plating, doublings, fashion plates, all with a view to providing additional stiffening to the superstructure where it was found to be required.

The ventilation systems, both mechanical and natural, have been thoroughly modernized and the air changes are in accord with the very best marine practice. Twelve new mechanical ventilation sets were installed and the old sets over-

hauled and extended. The natural ventilators were thoroughly overhauled.

NEW WIRING INSTALLED

The ship was rewired throughout with lead and armored cable. New electric lighting fixtures were fitted and wired with the loop system with lights in staterooms controlled by three and four way switches. A new telephone system, of the Magnavox type, was installed. A new annunciator system, of the Cory reset type, was installed with a reset button at each stateroom door. The switchboard was remodeled. Reversite circuit breakers were installed on each generator feed. Power bus bars were separated from lighting bus bars. The speed of the dynamos was reduced 45 revolutions per minute and the field coils of each generator lowered one-eighth inch to compensate for the slower speed.

All main subdivision bulkheads have been thoroughly gone over and made absolutely watertight. Wherever practicable, watertight doors in main subdivision bulkheads have been permanently closed. The main watertight doors are operated from the bridge by the Stone-Lloyd system.

All piping systems were reconditioned and extended to suit the new arrangement.

The aero fire alarm system is fitted throughout the passenger and crew accommodations while the Rich system has been installed in the cargo spaces.

The entire work was carried on under the direction of Captain R. D. Gatewood, manager, Maintenance and Repair Department, United States Shipping Board. Plans and specifications, which were noteworthy for their completeness and conciseness, were prepared by the technical staff of the United States Lines, under the supervision of Mr. Carl E. Petersen, naval architect of the United States Lines, and Mr. A. D. Woods, naval architect of the United States Shipping Board, both of whom also supervised the work of reconditioning. Mr. B. D. Pender, assisted in the reconditioning work, having charge of all furnishings and stewards equipment.

Only Ships Best Meeting Requirements Are Efficient

Navy Design Methods, Allowing Several Basic Solutions,
Could Be Used Advantageously in Merchant Marine Practice

By James L. Bates*

A NUMBER of years ago Rear-Admiral W. L. Capps, then Chief Constructor of the United States Navy, gave this advice to the writer: "Young man, it is better to be conservative during the design period than to be sorry on the trial trip." Doubtless the idea thus expressed is familiar enough. In fact, its very familiarity testifies to the general prevalence of dangerous optimism in design. However, in spite of the appreciation of the serious consequences involved, recurring instances prove that over-confidence, lack of thoroughness, even ignorance, are far more prevalent among us who design and build ships than we care to admit.

The following seven instances, all occurring within very recent years and in many cases coming under the personal observation of the writer, will serve to illustrate the nature of these shortcomings.

CASE NO. 1

A vessel intended for a familiar service, one in which hundreds of vessels have successfully operated for years, recently went on her trials and realized about $\frac{1}{2}$ her designed

speed. Investigation showed a very poor form of hull for driving, very light, high speed machinery for the kind of service, propellers of inadequate diameter and area, and an underbody form and shaft location which rendered a material increase of propeller diameter very difficult, if possible at all. Her performance was ultimately improved after changes had been made in machinery and propellers; but this improvement was realized at considerable expense to the owners, both because of the actual cost of the changes and because of the loss in income due to the vessel's enforced idleness.

CASE NO. 2

After successfully running for some years, a vessel was taken out of service to be fitted with a new and much heavier machinery installation. Deep longitudinal girders were built into her hull, and everything was nearly ready for the actual placing of the machinery when it was discovered that several of the heaviest longitudinal strength members were cut in the vicinity of the forward quarter point. An investigation showed that at this point an excessive concentration of stresses might be anticipated, particularly when being driven into a head sea. Compensation

*Author of Basic Design; in Charge of Basic Design Section, Bureau of Construction and Repair, Navy Department, Washington, D. C.

was designed and fitted with satisfactory results, but at the cost of much worry and some expense and delay.

CASE No. 3

An oil tanker was built, standard in type and in nearly all features of construction, but she had great beam and nearly twice the metacentric height usual in vessels of her type and size. This vessel at sea developed a complete period of roll of from 7 to 8 seconds. After several seasons in service the ship's structure showed signs of serious racking.

CASE No. 4

A cargo vessel was built, slightly larger than her predecessor also built in the same yard. In service she showed insufficient stability. Consequently, she has carried during her entire life a large amount of permanent ballast, a dead loss in cargo capacity.

CASE No. 5

A vessel was designed for passenger service. When the plans were well advanced and construction actually begun her prospective owner decided to put on an additional complete deck in order to increase her accommodations and, incidentally, their own income. The additional deck was fitted, but no change made in the original underbody. In service the vessel was very tender, nearly always requiring water ballast and the most constant attention to keep her upright.

CASE No. 6

A completed vessel went on her trials and failed to make her speed. The contract provided a money penalty for such failure. A careful investigation, which was undertaken to ascertain the reasons therefor resulted in the discovery that the trial had been run in shallow water, which in itself put the vessel at a disadvantage, and that the form of hull aft was such as to render the propellers very inefficient. Of course, the trial could be run again under proper conditions, but the hull form could not be altered. Therefore, the inefficient hull must be driven during her entire period of service.

CASE No. 7

An expensive yacht was built of materials unsuited to service in salt water. This vessel literally fell to pieces, becoming a total loss.

Such mistakes not only increase the original money outlay, but frequently decrease the ship's earning power throughout her life. They are generally chargeable to faulty design. In some of the above cases the naval architect, and in others the marine engineer, was the culprit. Different reasons could be given for such failures. Poor judgment or lack of knowledge is sometimes the cause. Sometimes an unwillingness on the part of the business men involved to secure expert advice because of the added expense, or an anxiety to hurry the job into production at the earliest moment is responsible. Attempts to utilize previous unsuitable designs as the basis for the new, or to crowd too much into limited dimensions, are sources of trouble. The important facts are that such serious failures, and many more like

them, have occurred, and, knowing them, we should do our best to prevent their repetition.

GIVE MORE TIME TO EARLY STAGES OF DESIGN

The writer believes that more time given and more attention paid to the early stages of design will assist materially in increasing the efficiency of our shipping because it will guard against mistakes such as those above described. Such a claim appears reasonable enough when one reflects that this, the preliminary design period, is the period in which type, size, power, dimensions, etc., are fixed, and that the work of detail design subsequently carried out is, to a large extent, a matter of routine which, with moderate care and intelligence, will be satisfactory. By devoting relatively more time to the consideration of these principal features and their proper relation one to another, not only is more rapid progress during the detail design period assured, but a greater assurance that the final result will be satisfactory is obtained.

FORMER NAVY METHOD

The development in the preliminary design of ships which has taken place in the Bureau of Construction and Repair, Navy Department, during the past fifteen years will serve to illustrate these points. When the first of our all-big-gun battleships was designed it was the practice to select type and dimensions and proceed at once to prepare a general arrangement layout to a scale of $1/16$ inch = 1 foot. This layout was made in considerable detail, including profile, deck and platform plans and type sections. All the main structural and many minor bulkheads were shown. The assignment for the use of the principal compartments was indicated. Boat stowage was worked out. Gun positions for both main and secondary battery were fixed. An approximation to the weight and center of gravity was prepared. If this showed satisfactory results, the plans, together with the necessary descriptive matter, were forwarded to the Department for examination, comment and approval. The considerations of strength, cruising radius, and even speed and power were somewhat superficial being largely left for a later date. The data presented were carefully considered by the Department and returned to the Bureau. The comment made, as might have been expected in view of the character of the information furnished, was in great detail, frequently covering such minor items as the location and arrangement of offices, pantries, etc. In other words, both in the Bureau and the Department, much time and attention was given to detail at a period in the design when all the consideration should have been given to features of more general importance. The result was that but a very few solutions to a given design problem could be worked out with the time and force available, and that but a small portion of the possible field could be adequately covered.

PRESENT NAVY METHOD

At the present time the problem is attacked with the idea of developing the possibilities of a number of different designs and presenting them in comparable form so that

These methods and suggestions, valuable as they have proven in the work of the Navy Department, where so many types and sizes of vessels must be investigated that it is necessary to employ certain men almost constantly for the purpose, may not prove of such value to private concerns where the problems which require such investigation are less numerous. Nevertheless, the naval architects of these concerns and as many of their assistants as necessary should be thoroughly familiar with these principles and the methods of applying them efficiently so as to be able to perform this work when required. Organizations which are not warranted in employing regularly a force qualified for such work will serve their own best interests by securing competent advice when needed.

a design may be adopted, not merely because it has been prepared and meets the requirements, but because it has been shown by comparison with a sufficient number of others to best meet the requirements.

The work is carried out in a logical series of steps.

First, a displacement suited to the type of ship and the armament, protection, and machinery contemplated is selected.

Second, a length suited to the speed and displacement is adopted.

Third, a depth sufficient for a satisfactory strength girder and a proper arrangement of decks is selected. Suitable midship scantlings are also outlined.

Fourth, a beam which will insure adequate stability and a reasonable period of roll is picked.

Fifth, a suitable form of underbody is chosen and an estimate of the power for the desired speed worked out.

Sixth, a small scale plan (from 1/50 inch to 1/100 inch = 1 foot), showing general arrangement of the principal features and giving the principal characteristics in tabular form, is prepared.

Seventh, a preliminary body plan for use during the preliminary design stage and suitable for the preparation of a model for towing in the experimental basin is made.

Eighth, an approximate estimate of weight in the several conditions of loading is made.

The above is as accurate a statement of the usual procedure as can be made. As a matter of fact, it is usually necessary to take some of the steps simultaneously in order to insure maintaining a proper relationship between them.

STANDARD FORMS USED

Standard forms have been prepared for use in connection with the above steps so as to secure a proper order of procedure and minimize the possibility of omitting any of them.

Special compilations or arrangements of data have been prepared so that these various steps may be taken with a minimum of effort and with minimum danger of error.

The seventh step is sometimes omitted or only partially carried out if the urgency of the case demands that it be taken into consideration.

When the sketch plan and the data connected therewith are complete all the information available is tabulated upon standard sheets so that it is readily comparable with similar information previously tabulated for other vessels of the same type and similar size. Such comparisons are very valuable in the discovery of inconsistencies and in bringing out points of difference.

Under this system it is possible to prepare data for submission to the Department upon very short notice, and these data are much more complete and reliable insofar as basic considerations of importance are concerned than were those submitted under the old method. Moreover, the effect of the present method is to center attention on the more important features and to relegate to their proper time and place matters of detail arrangement and construction.

RESULTS OBTAINED WITH THIS METHOD

An idea of the character of the results obtained in the design of naval vessels by the use of these methods may be obtained from the following instances:

A battleship had been tentatively outlined as to displacement, dimensions and power. As the result of investigation, her length was materially decreased, her draft increased and her power slightly increased, these changes combining to effect a reduction in the required displacement of nearly 5 percent without the sacrifice of any important feature as a consequence.

A submarine which had already passed through several

different stages of investigation was altered in her curve of sectional areas, and her waterline forward was changed so that her speed was increased about 7 percent without any increase in power.

A vessel of a given displacement and fairly well outlined design was given careful consideration from the standpoints of form of underbody and arrangement of strength members and of scantlings. The changes made resulted in increasing the ship's battery by 25 percent without sacrificing other features of value.

APPLICATION TO MERCHANT MARINE

The application in principle, at least, of the previously described ideas should prove beneficial to many design organizations. In order, however, to realize the fullest benefit therefrom there should exist a clear conception of the essential differences between the general and the detail considerations of design; a realization of the number of solutions possible for any design problem, and an appreciation of the facilities offered by properly worked out preliminary design methods for bringing out the salient features of the different solutions in their proper relations.

A competent technical staff trained to the viewpoint of the preliminary designers should be available. This is not so simple a requirement as it might at first seem. It is frequently difficult, sometimes impossible, to educate the man, who has spent years in acquiring an accurate knowledge of the details of ships, to ignore them temporarily in order to deal with the general features such as type of ship, hull form, power, etc.

VALUE OF EXPERIMENTAL MODEL BASINS

There must also exist an appreciation of the value of and a willingness to utilize the facilities of experimental model basins, testing laboratories, etc., or at least to secure advice and information from representatives of such organizations or other experts relative to features or appliances not previously handled and definitely understood.

Each organization will increase its efficiency by carefully arranging all its available data in convenient form for ready reference, as well as by utilizing published data closely applicable to the problems of the especial field which they cover.

In the Bureau of Construction and Repair, Admiral Taylor's "Speed and Power of Ships," Professor William Hovgaard's "Structural Design of Warships," the writer's "Basic Design of Modern Vessels," published as part of the "Shipbuilding Cyclopaedia," as well as numerous articles published in the technical press or read before technical societies, are constantly used for reference in the solution of problems to which they apply.

Liability for Personal Injury Fixed by Maritime Law

IN *Payne vs. Jacksonville Forwarding Company*, American Maritime Cases Vol. 1, page 524, the libellant was chief engineer of the *S. S. Harrish*, which had run aground, and was injured while voluntarily assisting the crew of a tug in making fast a line to the *Harrish*. The tug surged ahead, the line broke and libellant was injured. He filed a libel against the owner of the tug charging negligence. The Court said, that since this is a maritime tort respondent, liability is fixed by the maritime law and not by the Hazardous Employment Act of Florida and therefore this being a suit by a seaman for damages and not for maintenance and cure and wages, the negligence of the master is no ground for recovery, as section 20 of the Seamen's Act of March 4, 1915, does not make the shipowner liable for the master's negligence.



Typical Standard Oil Tanker

Notes on Efficiency in Operation of Oil Tankers

Proper Design for Specific Trade, Upkeep and Eternal
Vigilance Over All Divisions of Operation, the Vital Factors

By Townsend J. Smith*

OF the various types of ships which make up the American Merchant Marine, the oil tanker is the type at present having the greatest percentage in service. Any economies, therefore, which may be attained with these vessels will have a proportionate influence on the whole. In a broad sense, the efficient and economical building or operating of tank steamers offers the same problems as does any other fleet, but there are certain points which require particular attention, due primarily to the kind of cargo carried and the short periods allowed in port for overhaul, running repairs, reception of stores, etc.

As a first consideration, it is well to have a clear understanding of what it meant by "economy." Economy is defined in the dictionary as "thrifty and careful administration," and "management without loss or waste." This describes exactly the ideal of every builder and operator, but the actual obtaining of the condition, where there is no loss or waste, is still in the future.

Economy is not necessarily a minimum money expenditure, although many a famous and prosperous steamship company has been managed so that one shilling has worked overtime and done the work of two, but economy can best be promoted by a careful watchfulness that expenditures are only made for items which have a present or future value. Thus it is the best of economy to have spare steering gear worms or segments in stock, as these parts, from experience, are found to require renewal at times, but it would be very poor economy to keep a spare bed plate for the same engine, a part which is generally good for the life of the ship.

In the search for true economy, we may divide the subject into three sections:

1. First cost,
2. Repairs and maintenance,
3. Operation.

PROPER DESIGN ESSENTIAL

As has been often stated the real economy in first cost is found where the vessel is carefully designed for a certain

trade and built as large and as powerful as the trade demands, but no larger and with no great excess of reserve power; power which will seldom be needed. In tank steamers the result of experience must go hand in hand with the best guess as to the future; for guess it must be to a large extent, with old oil fields and areas constantly going dry and new fields in distant parts of the world opening up daily. One way to anticipate these changes is to design the vessel so that alterations may easily be made, should occasion arise to put the ship in another service from that originally planned. In some cases it is well to provide extra large heavy duty pumps and heater coils for heavy cargo although gasoline may be the oil generally carried. Each oil company has its idea as to how far to provide for future contingencies, as each has its preference for type and size of ship.

To enter into the relative advantages of Diesel and steam driven tankers is to enter a discussion which can not be definitely answered now. Here again preference, or its half-brother prejudice, may enter in. So far it would seem that the human factor operating has as much or more to do with results than mechanical refinements.

Consumption of fuel down to .304 pound per indicated horsepower hour, of lubricating oil to .00255 pound per indicated horsepower hour, and a cost of fuel and lubricating oil down to 5.63 cents per 1,000 ton-miles, as recently reported for a 15,000-ton tank motor vessel, appears very attractive if these figures tell the whole story of expense entailed with motor operation.

As a practical question we need not be greatly concerned as to the kind of power outfit of new tank ships as the world seems well supplied at present.

The conversion of steamers to motor drive is a special condition requiring particular consideration for each case.

TONNAGE MEASUREMENT

A point sometimes overlooked in this country, perhaps not so much in recent years as formerly, is the tonnage measurement, a fee which is a fixed charge as long as the ship is

*Standard Transportation Company, New York.

navigated and may even form a basis for taxation when the vessel is laid up. Any reduction possible here in structure or arrangement, even if it requires alteration and read-measurement after building, is well worth looking into.

With the competition in American yards as keen as it is at this writing, any suggestions as to cutting down prices are apt to draw out remarks "not only loud but deep." However, it would seem that the cost of auxiliaries and their repair parts are out of line (as the stock brokers have it), with the cost of other component parts. This point has recently come to the fore in British yards also. There is a wide range in the first cost due to the various standards of owners with regard to outfitting, extra parts carried, reserve stores, etc. These are often overestimated and if the ship trades to ports with ordinary sources of supply and with ordinary repair facilities, much may be done to cut down expense here.

The form of hull and disposition of machinery has become, if not standardized, close to it, not so much from theoretical considerations as from experience. The present day practice of locating the machinery aft has much to recommend it and leads to a fairly good distribution of strain in the loaded vessel. The necessity of removing the thrust block and possibly an eccentric, when drawing the tail shaft, together with rather restricted handling room, are the detailed objections.

REPAIRS AND MAINTENANCE

Proceeding on our second line of inquiry, economy in repairs and maintenance, we find the following sub-divisions, all fluctuating widely at different times, with different owners, and with different types of ships:

- a. Ordinary upkeep.
- b. Bottom painting and under water care.
- c. Attention to "damage and accidents."
- d. Insurance surveys, and governmental examinations.
- e. Carelessness.
- f. Obsolescence.

ORDINARY UPKEEP

Any structure exposed to the elements is bound to suffer wear and corrosion, the principal cause of wastage in a steel structure must be guarded against. Paint of a good quality is the usual retarding agent employed but it is more than wasted unless the surfaces to which it is applied are dry and free from scale. Scaling in itself is not an attractive job and unless someone with good eyesight is employed to follow up this work, corners and backs of reverse bars, clips, surfaces above a man's reach, etc., are very liable to be brushed over without regard to the condition, and corrosion still goes on unchecked.

The preservation of wood decks by recalcing after a year in service and the paying of the seams with a proven composition is of greater value than merely the saving on the wood, as once water finds its way through the seams, the plating below starts to corrode.

Although it would seem unnecessary to call attention to this, the keeping free of wildcats, valves, roller chocks, goose-necks, etc., is an important point as the failure of these to function means just so much first cost locked up without a return in service.

UPKEEP DEPENDS LARGELY UPON PERSONNEL

Ordinary upkeep is a matter partly in the hands of the shore staff but the actual work is largely in the charge of the ship's officers, so that a fresh coat of paint may cover many a fault or it may be the sign of a most intelligent superintendency and care.

Up to the present no satisfactory paint or solution has been found which can be used on the interior surfaces of a cargo tank. Many oils are corrosive in action; especially those containing sulphur, so that in tank vessels, corrosion

and scale are generally found on both sides of the shell and bulkhead plating. With a vessel continually in "heavy" oil service this scale forms more slowly and is not so detrimental as when it is on the surfaces of "light" oil tanks where particles or slabs of rust dissolving may cause a cargo to be off color; or if not dissolved, may find its way under valve seats and discs causing "mixed cargoes," reports of leaky valves and pipe lines. In general it will be found that straight way brass mounted gate valves, with renewable discs, hand holes, etc., give the best service here, although the British have a strong leaning toward the globe valve with its more tortuous passage but more easily ground in seat.

Pipe lines are generally found to go first outside at the threaded ends and here a rust proof mixture will prolong the life somewhat. Another scheme where lines have rusted due to drainage lying in the bottom is to turn the pipes 180 degrees, but it is questionable if the saving in doing this is worth while.

BOTTOM PAINTING AND UNDER WATER CARE

The question of dry docking and painting under water body is the same with tank steamers as with other vessels. Where certainty of route can be assured, once in eight months makes a schedule frequent enough to allow examination of under water fittings, etc. Renewal of the protective zinc slabs will probably be necessary then. These have proven their worth and, even with steel or iron propellers, should be fitted to combat the action of the couple set up by steel of hull, tips of blades and brass in stern bearing. Bronze studs in sea chests are worth the expense, but it is questionable if entire bronze strainers are worth while.

Painting at night is a very uneconomical performance for many reasons and is only resorted to under great stress.

ATTENDING TO "DAMAGES AND ACCIDENTS"

One item which may need close attention, in fact generally receives it, may be classed as those miscellaneous damages caused by tugs, lock walls, bridge abutments, barges alongside, etc. If serious they are generally surveyed and permanently repaired but if not, especially if the owner's agents are responsible, the repairs, due to shortness of time in port, are "put off until next trip." Generally any damage near an oil tight bulkhead, sea connection or scupper is repaired. In course of time these damages taken all together may amount to a very considerable item.

This brings in the question of steaming and cleaning tanks, a very expensive operation, the cost of which may run up to double or quadruple the direct cost of repairs. However work should never be taken in hand until the tank in need of attention and the one each side of it has been certified. The drainings from pipe lines, valves and pumps should be disposed of or these parts blanked off while repairs are in progress. So important is this that the authorities in many British ports require a chemist's test to be made and certificate to be issued each working day. As is well known the liquid cargo is comparatively harmless when open to the air but the gas generated is highly explosive, lodging in the corners, behind brackets, valve pockets, under loose scale, etc. No amount of care can be considered excessive.

Some of the tank cleaning superintendents have become so expert that they have been reported to have struck a match in the tanks so that the chemist would have a good sample. No better display of self-confidence can be imagined.

INSURANCE SURVEYS AND GOVERNMENTAL EXAMINATION

The classification survey is another division where economy is best served by care in the original design as to accessibility, minimum of structural parts and attention to the immediate making good of small damages, etc. The drawing an examination of tail shaft, opening up of pumps, sea valve and the machinery survey in general, follow the usual line. The testing of tanks if the rules are followed literally

a time and money consuming operation, but the societies accept the filling of alternate tanks with cargo as a bulkhead test and are generally liberal in their interpretation of the rules with bona fide owners, recognizing that the time element is most important. The survey periods on many tankers were entirely disorganized during the war, but there is no record of more than normal wastage in this period, which speaks well for their previous upkeep and condition.

With British ships the Board of Trade, while careful of the safety factor and seaworthiness of the ship, is not concerned with details and ordinary good practice may be assumed as receiving their sanction.

The United States Steamboat Inspection Service requirements, while not directed so much as to the cargo in tank vessels, are particularly explicit as to requirements for the bunkers and oil burning equipment, so that not many special economies can be made in the original installation and duplication of heaters, strainers, etc. It is not good economy to aim at simplifying the piping by too much interchangeability of pump services, especially should bilge and fire lines be independent of cargo piping, with no cross connections.

The United States annual steamboat inspection ruling that the cargo should be out of the vessel when undergoing inspection works a particular hardship on tankers. The original motive behind the requirement was probably to determine the condition of the ship's interior structure, but this is usually impossible on account of gas remaining from the cargo. The fact that the bulkheads are spaced so much closer than with other cargo vessels insures seaworthiness and this empty ship ruling might well be rescinded.

CARELESSNESS

It is safe to say that 50 percent of the accidents to personnel, auxiliaries, cargoes, etc., are due to carelessness, pure and simple. This is a matter which is partly controllable but with ever-changing crews not possible to eliminate. Accidents are unavoidable but errors of the same kind must not be repeated by the same people. The great danger lies in the mixing of the cargoes from various tanks through wrong manipulation of valves. It is usual to paint hand wheels of valves for different services distinctive colors and it has been suggested as a further precaution for night handling that they be of different shapes; hexagonal, square, offset vertically, etc. A very definite line of demarcation as to the duties of deck and engine room crews must be insisted on in all matters pertaining to pumping cargo.

In speaking of carelessness we can go one step further and include sabotage, which, while not very often experienced, should be borne in mind.

OBSOLESCENCE

This term includes not only physical deterioration but more especially the condition arrived at after several years' hard service or when trade conditions have changed. This means in a tanker that the pumps and pipe lines are too small, loading and discharging facilities limited, speed below modern requirements and cargo capacity too small for up-to-date shore receiving and storage plants. Types too are superseded. From the original tank ship until recently the poop, bridge and forecastle ships were used, but now only shelter deck ships are considered in the larger types. These in turn may be replaced by another style in the future. The whale-back is in the classic example of a fad, which, while not by any means a failure, was not suitable to survive in competition with more normally formed hulls.

OPERATION

Arriving at our third division, operation, here we have an intangible target to shoot at, as no standard can be laid down as absolutely the point of 100 percent efficiency. The following sub-divisions as recently stated give normal figures for operation excluding corporate overhead and taxes:

	Percent
Depreciation (5 percent of value)	6.7
Interest (5 percent of value)	6.7
Insurance (at 3.75 percent of value)	5.1
Repairs	11.6
Wages	21.2
Subsistence	4.2
Fuel	33.6
Stores and equipment	9.4
Miscellaneous	1.5
Total	100.0

That these percentages are fixed for any one ship or fleet for any considerable time is open to question.

Various standards of efficiency have been proposed when putting ship against ship, such as ton-mile cost, tons carried per year, maintenance of repair cost per deadweight ton, etc., etc., many of which depend on the personal opinions of the compiler. Any comparison embracing net tonnage is of no use whatever, as net tonnage is an arbitrary thing with no real relation to the size of "ableness" of the vessel.

The elaborate theoretical tables and formulæ sometimes developed which give a numerical index of performance are not to be depended upon, as they require figures and costs seldom available in a form to be used in combination with technical matters and it is hopeless to expect the purely actuarial and engineering divisions to agree on the relative importance of each other's points or data, even should time allow an extended analysis. The action of the U. S. Shipping Board in building up a staff of research and trial experts is a move which might well be followed by private companies, provided the result of such inquiries were promptly put into practice and not made merely the contents of some enthusiast's data book.

The two largest items in the cost sub-division above are wages and fuel. The costs in both cases are set by general conditions over which the operator has small control and his only hope for economy is in using his labor to the best advantage with his fuel at a minimum, viewed from every angle.

The subject of careful fuel burning with both coal and oil has received much intelligent attention and experiments of all kinds are constantly in hand. The literature here is very extensive, so much so that many of the fuel oil advertising catalogues might well be used as text-books in thermodynamics. With few exceptions any of the good fuel burning systems will bear comparison with any other.

The same spirit of inquiry has been shown lately with regard to economical handling of feed water heaters, superheaters, electric auxiliaries, etc., improvement in any one of which is a subject too large for this article.

In tankers, the cargo pumps may be considered the heart of the outfit and the pipe lines the arteries. Compound pumps have not found extensive favor in spite of their lower steam consumption in theory. Up to the present 12 inches is the most convenient pipe size for main lines in a large ship with 8 by 10-inch discharges. One detailed source of loss both in fuel burned and in material wasted occurs when the insulation of deck piping is carried away by seas. This damage the shelter-decker escapes. Ordinary covering is short lived and with a double pipe arrangement the effect is often just the opposite to the designer's intention, due to water-lodging in the outer casing. This is only one point of the many that will occur to any one who has ever dealt with this class of ship.

To repeat what was stated at first, there is no easy road to economy and with every care one year's showing may be very poor when matched against another's, since absolute standards are impossible and a thousand factors enter the problem. It is a subject not taught in the books although books may show the path.

To sum up: Eternal vigilance is the price of liberty—from extravagance and a deficit.

Applications of Arc Welding to Ship Construction—II

Details of Welding Construction—Repairs to ex-German Liners — System for Designating Types of Work

By E. H. Ewertz*

THE Electric Welding Company, Gothenburg, Sweden, constructed in 1920, the first electric arc welded ship in that country. This was a tugboat 52 feet 6 inches long, 13 feet 6 inches molded breadth and 7 feet molded depth, having a draft of 3 feet 6 inches. The construction

*General Manager, Moore Plant, Bethlehem Shipbuilding Corporation, Ltd., Elizabeth, N. J.

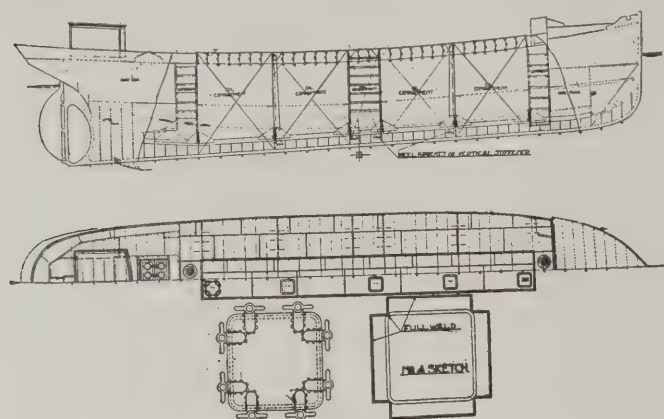


Fig. 22.—Profile and Half-Plan of Dairyo Maru

was in accordance with Lloyd's rules for riveting but welding was used throughout, eliminating practically all riveting. No recent report is available as to her performance.

About the time this tug was built in Sweden by the Electric Welding Company, a similar size tug was constructed by licensees of the Kjellberg system in Caen, France.

From the shipyard of Kyle & Purdy, City Island, New York, N. Y., a torpedo boat was launched in December, 1920, called the *Sea Hornet*. She was really a motorboat, 58 feet long, with a 600 horsepower engine having a speed of about 35 knots and a cruising radius of 800 miles. This boat was constructed of No. 10 gage steel plates, having 1 inch by 1½ inch angle frames. Bulkheads were fitted so as to make her practically non-sinkable. Electric arc welding was used throughout for all joints, the shell being all butt welded so as to leave a perfectly smooth surface. Thousands of miles have been covered by this motorboat up and down the Atlantic Coast in all sorts of weather and after ten months' service no defects were found.

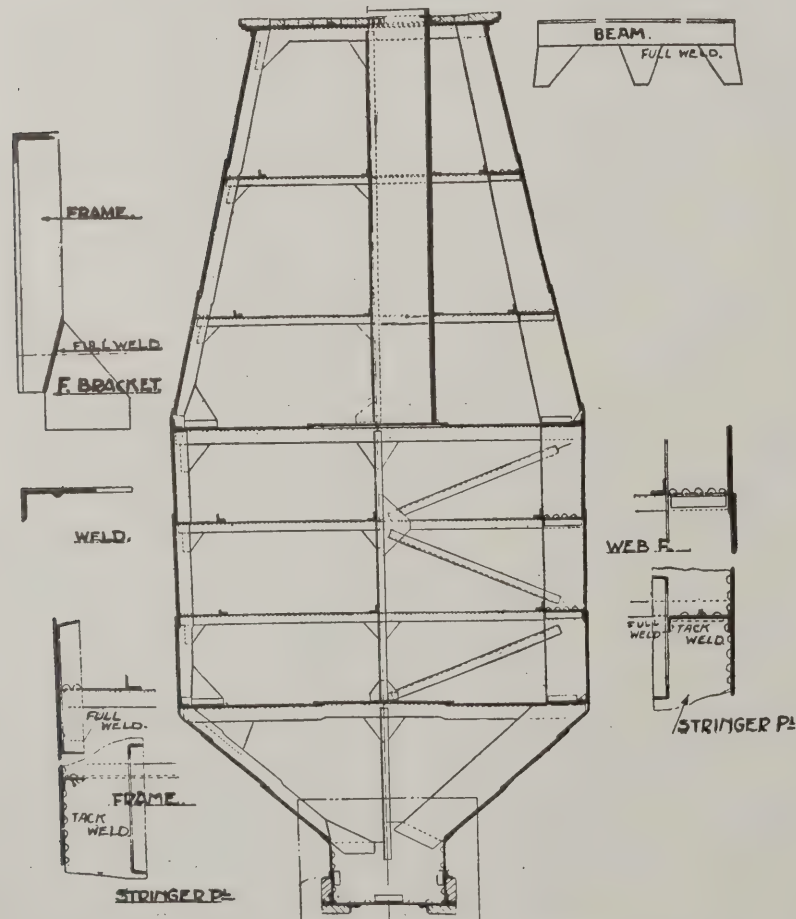


Fig. 23.—Midship Section of Caisson for Hikoshima No. 2 Dock

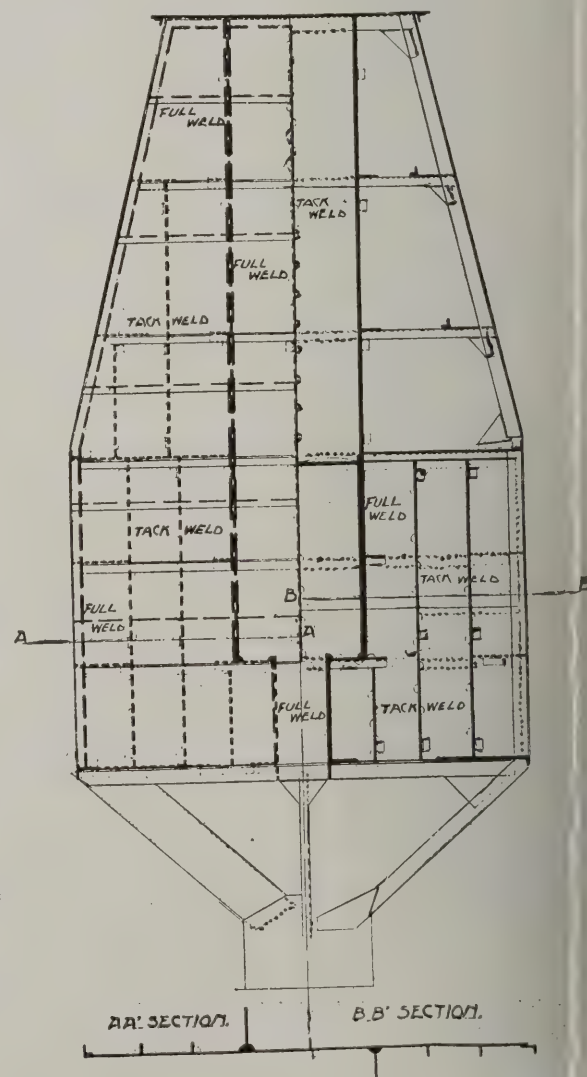


Fig. 24.—Watertight and Partial Bulkheads of Caisson

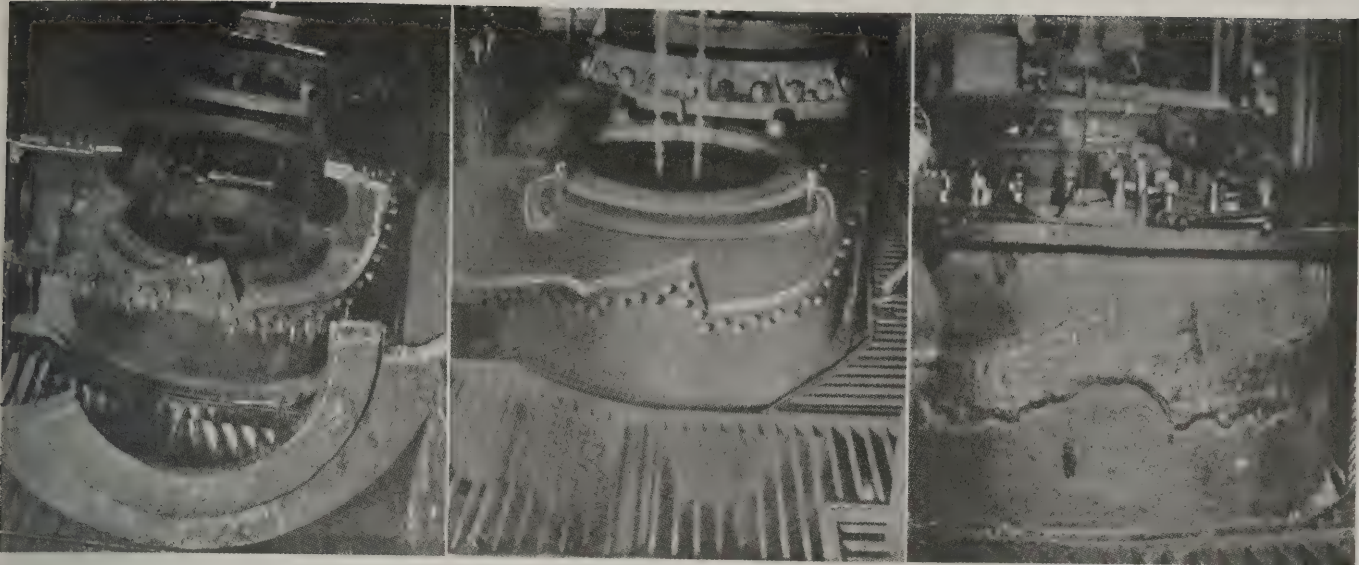


Fig. 25.—Repair by Arc Welding of Difficult Break on First Intermediate Pressure Cylinder on S. S. Pocahontas (ex-Princess Irene)

In Japan we find the electric arc welding used extensively in new construction as well as in ship repairs. The Mitsubishi Dockyard and Engine Works at Nagasaki are licensees of the Kjellberg arc welding system, and in a paper read by Mr. M. Haramiishi, general manager of the Kobe plant, before the Japanese Society of Shipbuilders, we find that in 1920 they undertook the conversion of the steam trawler *Dairyo Maru* into an oil lighter, capable of carrying about 300 tons deadweight.

HOW RECONDITIONING WAS DONE

This trawler was 95 feet long with a beam of 26 feet, and a depth 12 feet 6 inches. The wood deck, longitudinal bulkheads, bunker, casings, engine and boiler foundations as well as deck houses, funnel, mast, deck and engine machinery, piping, shafting, etc., were removed and six new oil tight bulkheads, forming two cofferdams and five oil compartments, with an expansion trunk extending the full length of the oil compartments were installed. New bulkheads were fitted, floors and reverse frames were removed and new bulk-

heads welded to the frames with a continuous weld to the shell and bulkhead on one side and tack welded on the other side. Deck plating was butt welded both on the ends and sides of the plating. Also the original stringer bars were cut out, the holes welded up and stringer plates welded to the shell plating. Reinforcing angles were fitted on the underside of the stringers between frames.

The expansion trunk side plating was connected to the deck with angles having full welds, heel and toes. Stiffeners of flat iron were welded on edge to the side plates. The trunk top plating was riveted to the beams and full butt welded at seams and butts. Oil hatchways were formed by angles having corners cut out and bent to form the square. This bar was welded heel and toe, and the hatch cover hinges and fastenings were tack welded on the edges, no holes being used, thereby eliminating any possible trouble of leaks. Bulkheads were welded much the same as deck plating. After completion, the tanks were tested with a 6 foot head, and some slight leaks were found where overhead welding had been used but these leaks were made



Fig. 26.—Method of Repairing Broken High Pressure Cylinder on S. S. George Washington by Means of Arc Welding

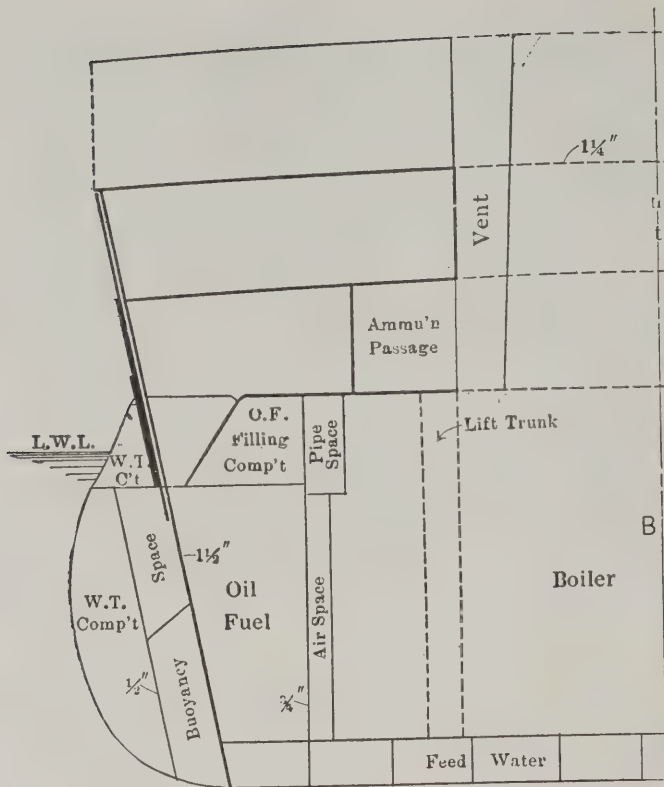


Fig. 27.—Section of Naval Capital Ship, Showing Bulge

tight by calking. All the work performed on this boat has proved entirely satisfactory to the owner of the vessel.

ELECTRIC WELDED CAISSON

Another very interesting construction where electric welding was used for practically all joints was the steel self-floating caisson for the 460 foot dry dock at Hikoshuma Dockyard. Brackets for frames and beams were butt welded. The hold stringer plates were tack welded to the shell and frame and web frames butt riveted to the beams. Deck

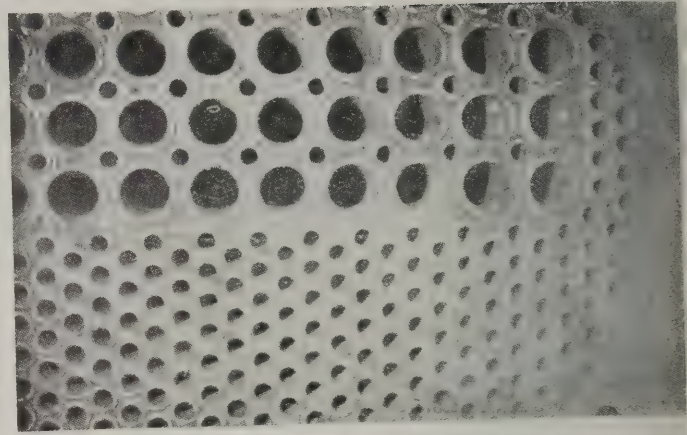


Fig. 29.—Boiler Tubes and Flues Welded to Tube Sheet



Fig. 30.—Setting Patch in Firebox Flush

stringers were fastened in the same way as the hold stringer except where watertightness was called for, in which case, angle bar connections were used to the shell with the seams

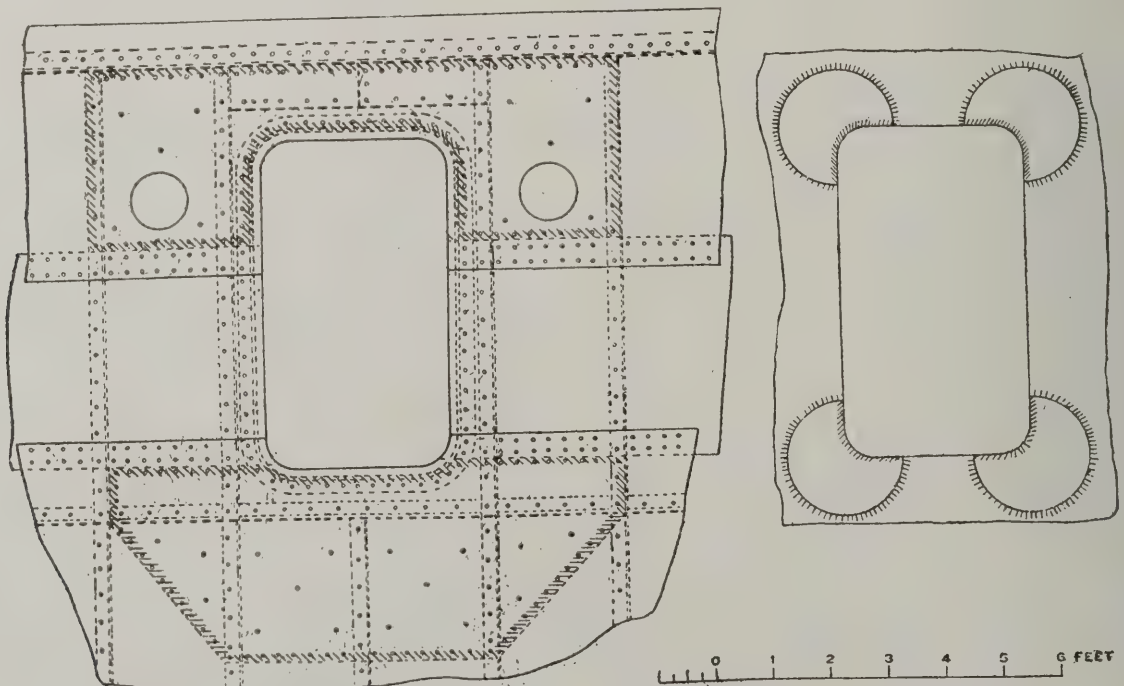


Fig. 28.—Doubling Plate in Way of Opening in Ship's Side on a Riveted Vessel and an Approved Method of Compensating for a Similar Opening by Welded Doubling Pieces

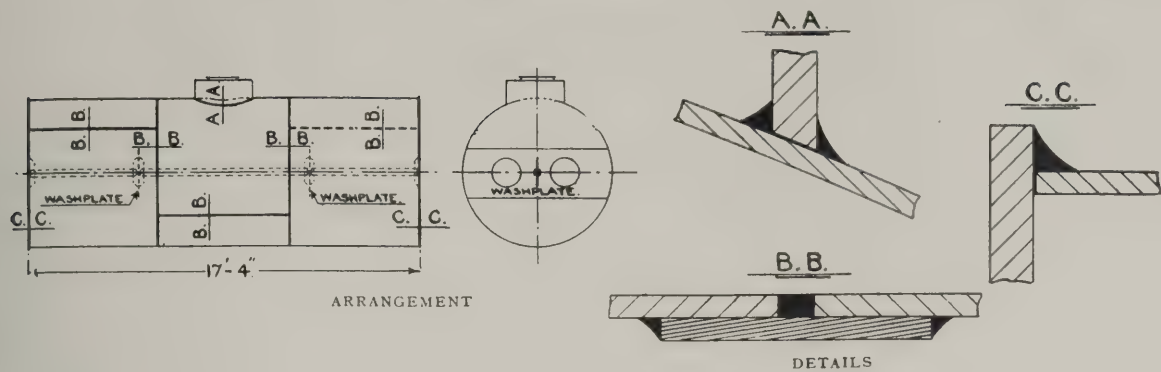


Fig. 31.—Details of Welding for Oil Fuel Tanks

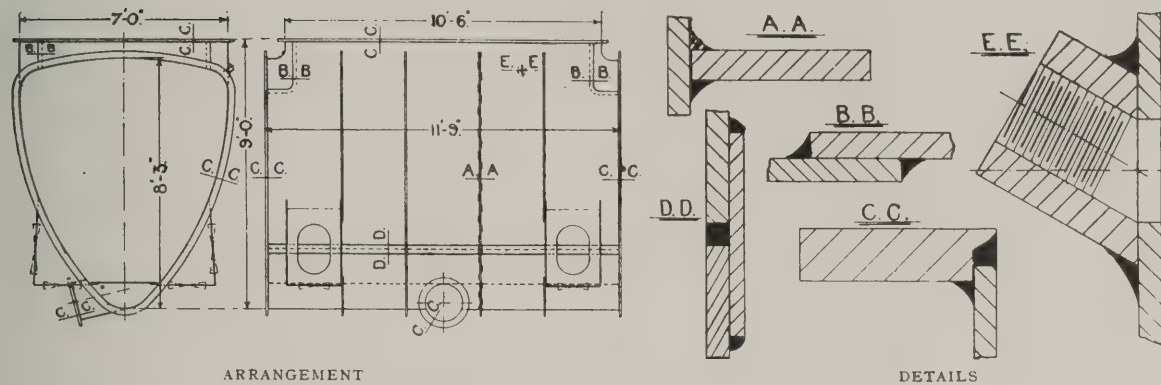


Fig. 32.—Arrangement and Details of Welded Condenser

and butts welded. In order to facilitate laying of the wood deck, all plating was butt welded leaving a flush deck. Bulkhead plating was fitted horizontally and it was lapped and full welded on the upper edge with tack welding on the lower edge. Bounding bars were full welded to the bulkheads but riveted to the shell. Trunks were plated vertically with corners and the butts were welded. All anglesmith work was practically omitted by the use of angles having corners cut out and welded either with or without filling in the corner of the cut flange. Doubling plates around manholes and

other stressed places were full welded along the edges with no holes for rivets. Floating plates and diaphragm plates were welded direct without the use of angles. All rail stanchion sockets, steps, eye pads and similar fittings were placed in position and tack welded. Fastening bolts for wood fenders were welded to the shell plating without penetrating the shell. All welded laps of plating were the width of a single riveted lap.

The report from the Dockyard is to the effect that the

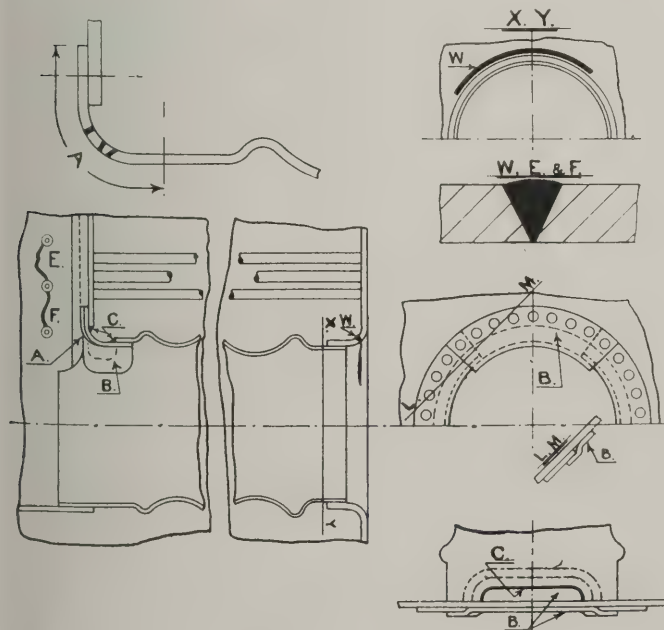


Fig. 33.—Part of Boiler Furnace Cut Out and New Piece Welded In. Several Cracks V-ed Out and Welded

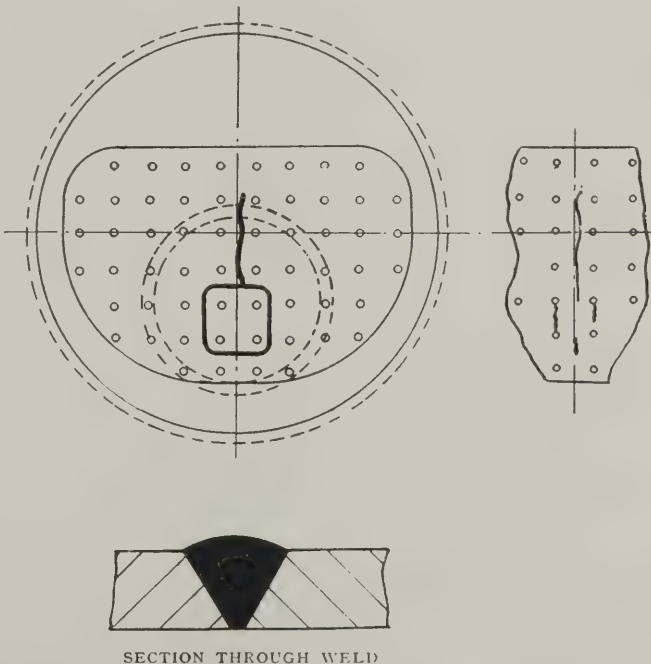


Fig. 34.—New Plate Welded in Combustion Chamber Back and Crack V-ed Out and Welded

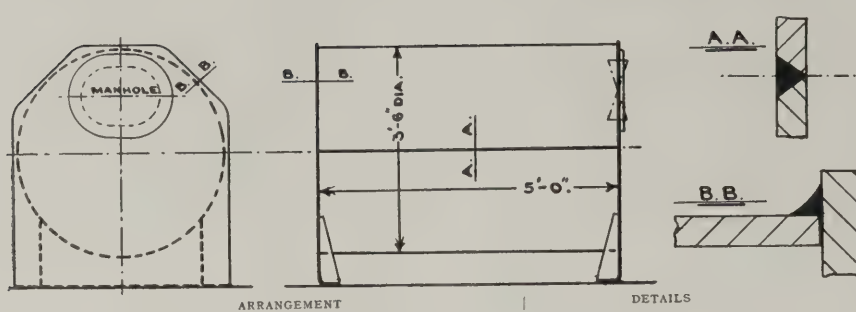


Fig. 35.—Water Storage Tank

"caisson is working very well without giving any trouble at all."

WELDED PONTOON FOR CRANE

The Kobe plant has constructed an all electric welded floating crane pontoon 65 feet long, 35 feet molded breadth, and 8 feet molded depth, having a rectangular form in cross sections and deck plan with the bottom plating at both ends curving upwards with a 30-inch radius. The plating is $\frac{5}{16}$ to $\frac{1}{4}$ inch thick, all joints being butt welded. Plating is stiffened by flat bar frames $3\frac{1}{2}$ inches by $\frac{3}{8}$ inch spaced

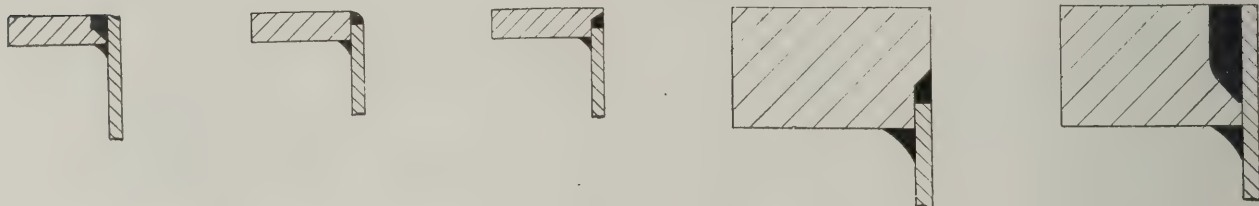


Fig. 36.—Flanges for Pipes

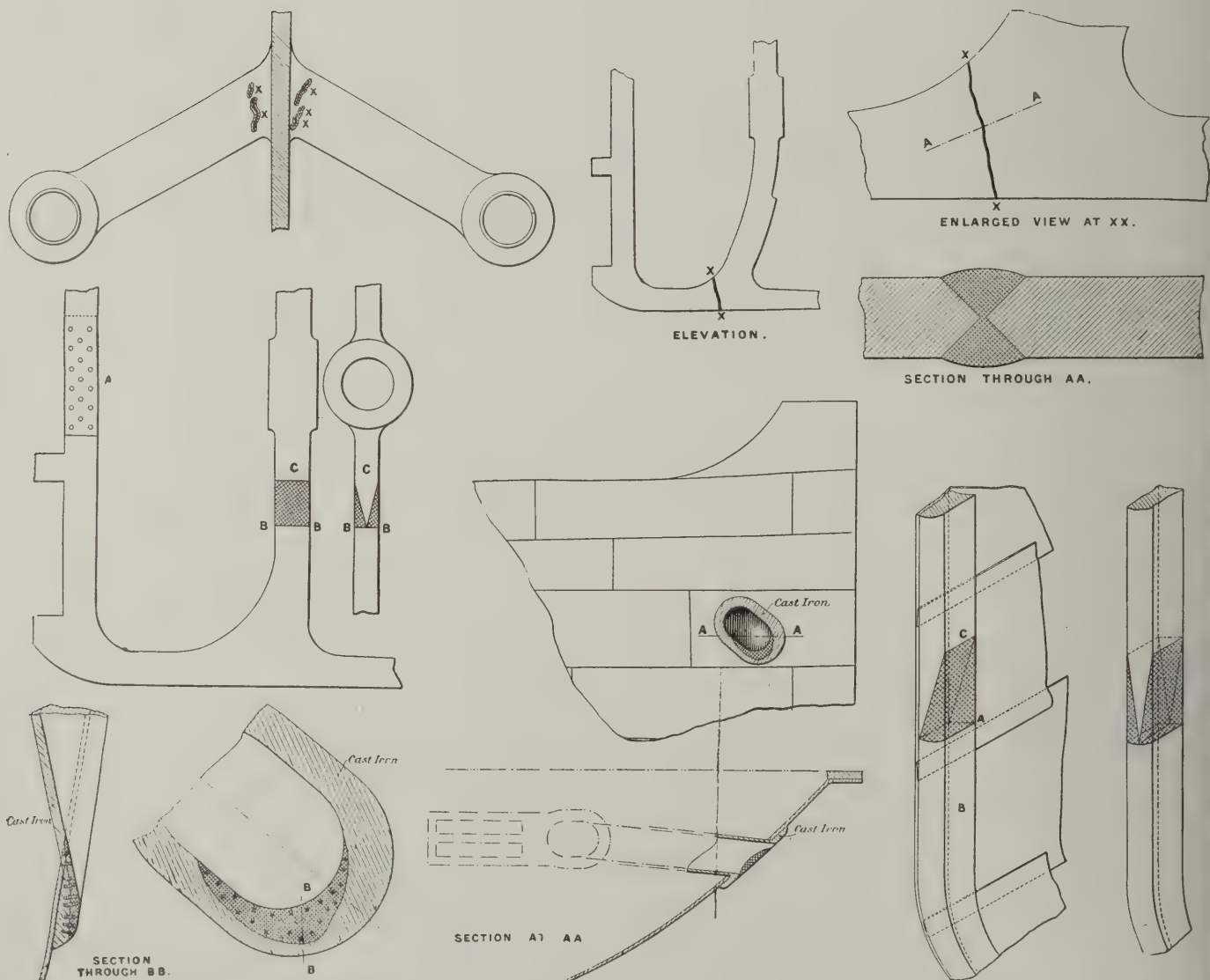


Fig. 37.—Examples of Electric Arc Work in Shipbuilding

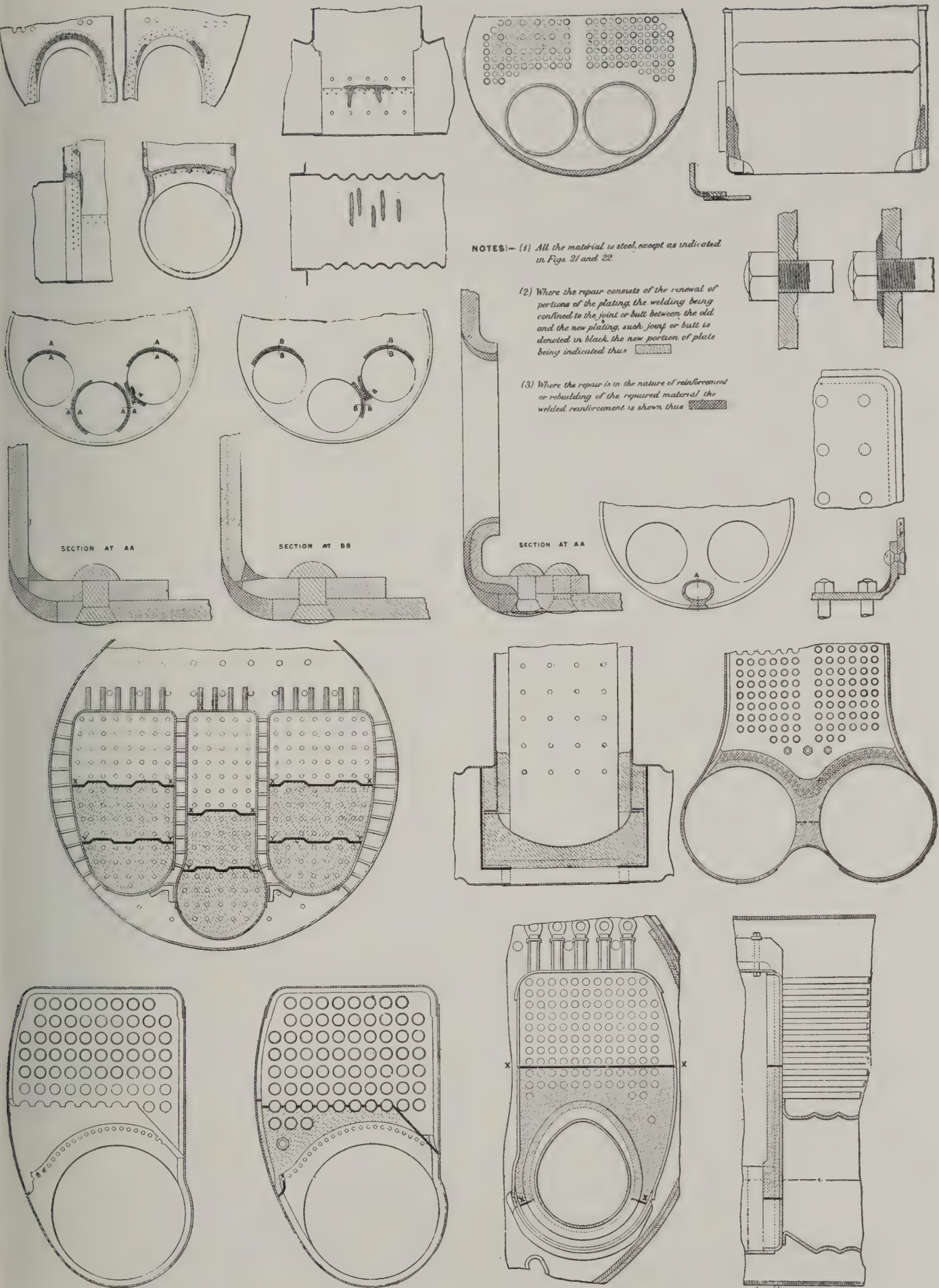


Fig. 38.—Examples of Electric Arc Welding in Boiler Work

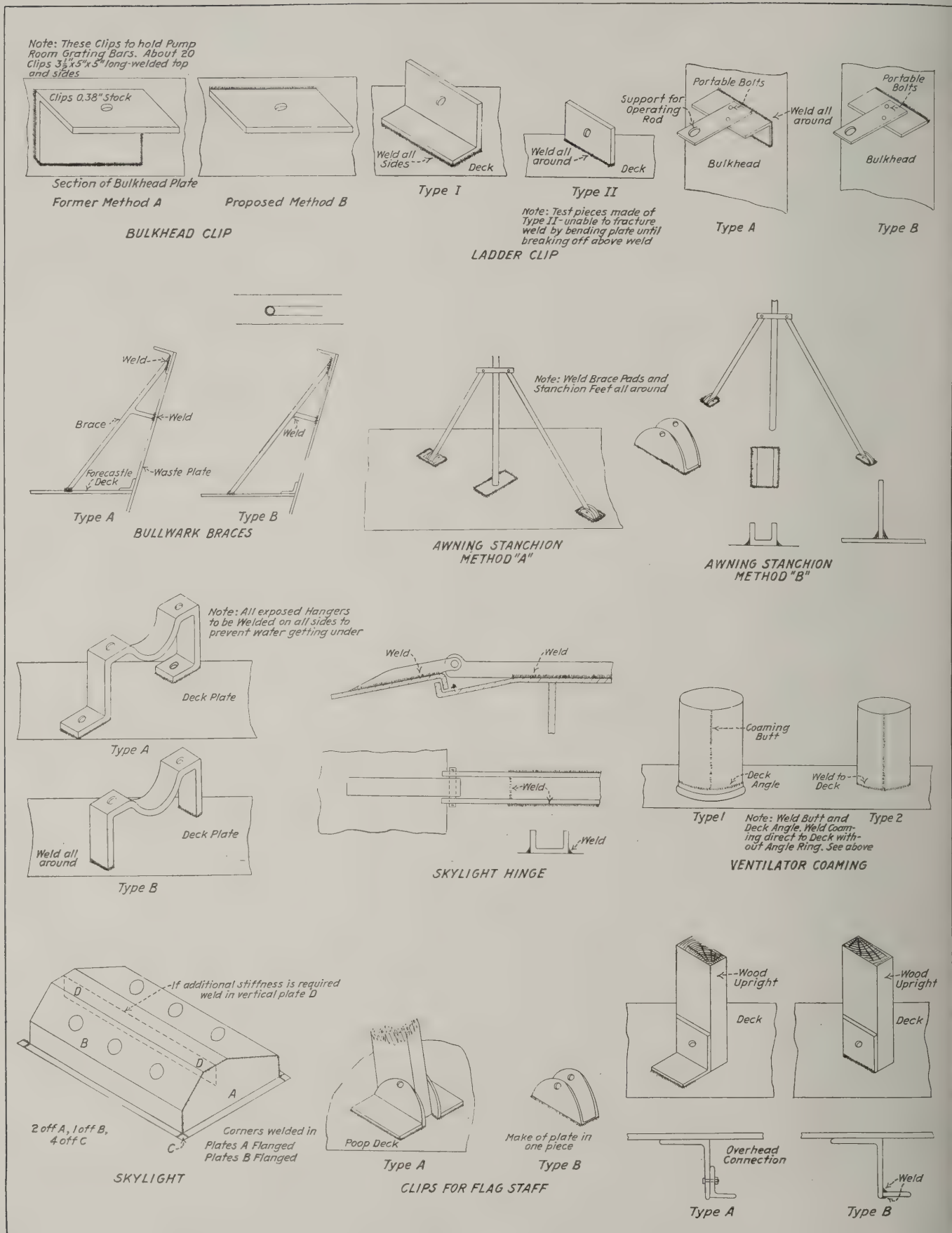


Fig. 39.—Applications of Arc Welding to Ship Construction

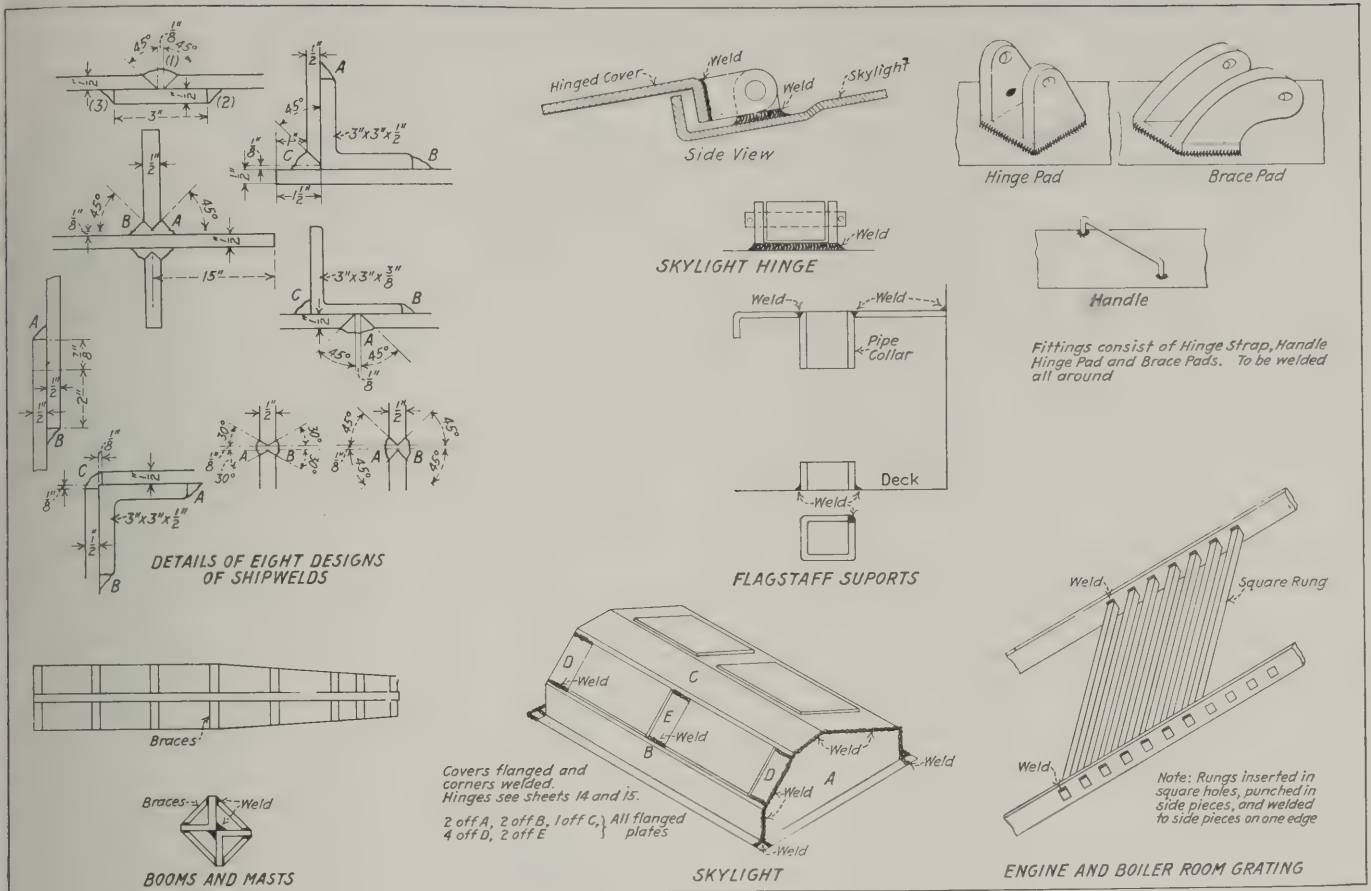


Fig. 40.—Applications of Arc Welding to Ship Construction

30 inches apart, and tack welded to the plating. Fore and aft as well as athwartship bulkheads are used for additional stiffening. Insofar as possible, overhead welding was avoided by building up large sections on the ground, and

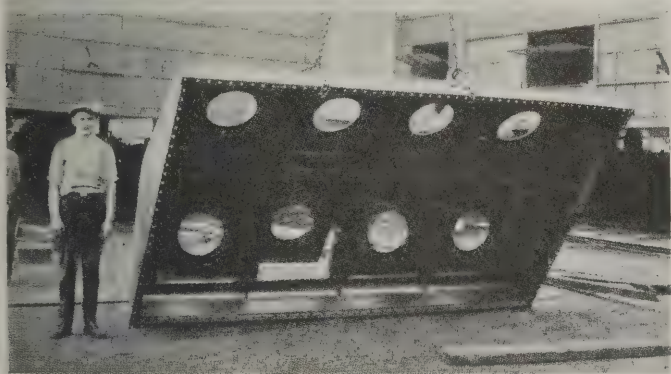


Fig. 41.—Interior of Welded Engine Room Skylight

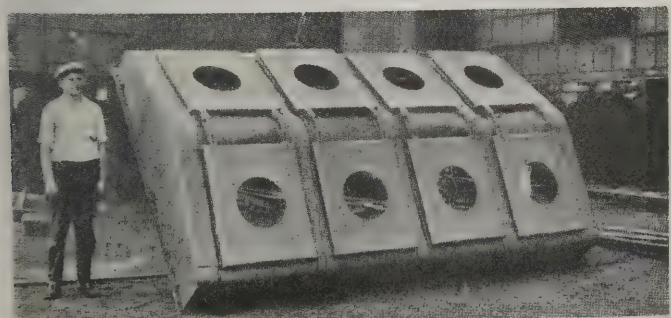


Fig. 42.—Exterior of Welded Engine Room Skylight

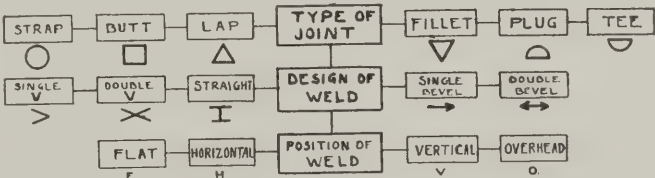


Fig. 43.—System of Designating Types of Welds

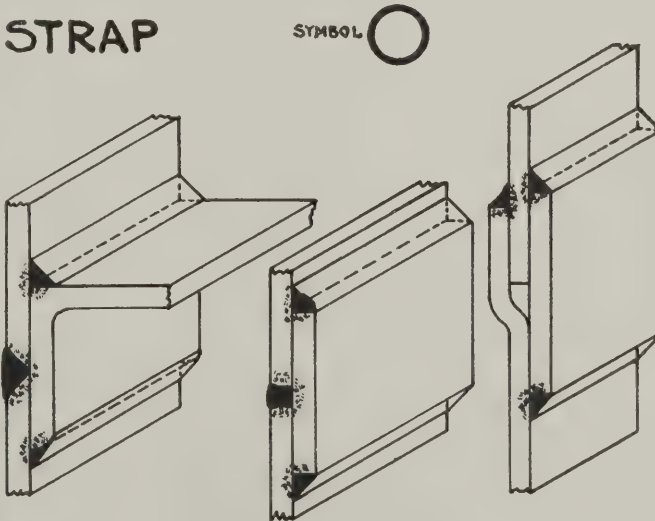


Fig. 44.—Type of Joint: Strap Weld

A strap weld is one in which the seam of two adjoining plates or surfaces is reinforced by any form or shape to add strength and stability to the joint or plate. In this form of weld the seam can only be welded from the side of the work opposite the reinforcement, and the reinforcement of whatever shape must be welded from the side of the work to which the reinforcement is applied.

BUTT

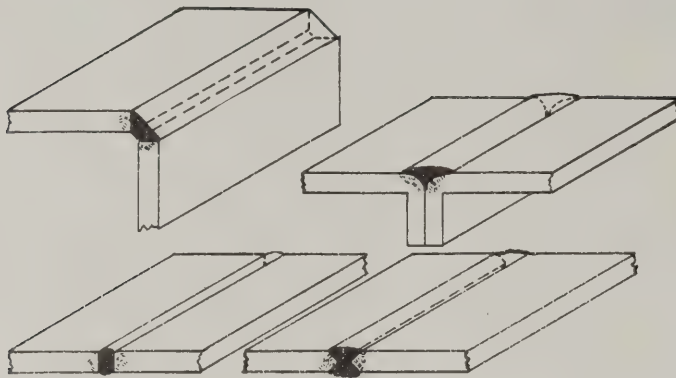
SYMBOL 

Fig. 45.—Type of Joint: Butt Weld

A butt weld is one in which two plates or surfaces are brought together edge to edge and welded along the seam thus formed. The two plates, when so welded, form a perfectly flat plane in themselves excluding the possible projective caused by other individual objects as frames, straps, stiffeners, etc., or the building up of the weld proper.

LAP

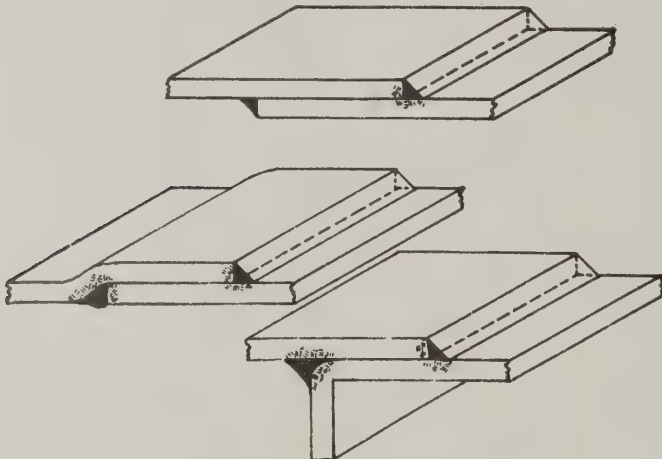
SYMBOL 

Fig. 46.—Type of Joint: Lap Weld

A lap weld is one in which the edges of two plates are set one above the other and the welding material so applied as to bind the edge of one plate to the face of the other plate. In this form of weld the seam or lap forms a raised surface along its entire extent.

then erecting. Mention is made of their difficulty to entirely avoid buckling of the light plates but that a copper-smith's skill of judging where cuts should be made to relieve stresses enabled them to eliminate these buckles and leave a smooth finished job.

Many other ships, all or partially welded, could be mentioned here, such as the 52-foot barge built by the S.O.S. Welding Corporation of Brooklyn, N. Y., or the 172-foot battle towing target constructed at the Norfolk Navy Yard, but we believe the data given will be sufficient to form a proper background to build on.

The use of electric arc welding in ship construction, aside from joining what is known as main strength members, such as shell and deck plating, keelsons, stringers, main bulkheads, etc., is very extensive and shipbuilders are familiar with such work, at least, to a limited extent.

MACHINERY REPAIRS ON EX-GERMAN LINERS

One of the most spectacular electric arc welding jobs was the repair of the main propulsion machinery on the German ships taken over by our Government when war was declared

FILLET

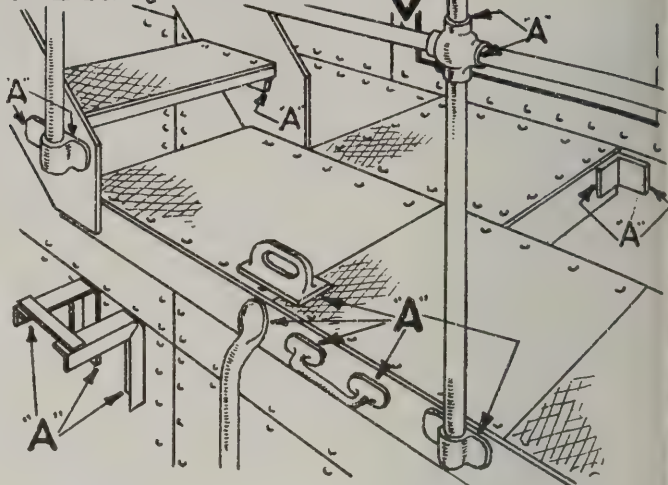
SYMBOL 

Fig. 47.—Type of Joint: Fillet Weld

A fillet weld is one in which some fixture or member is welded to the face of a plate, by welding along the vertical edge of the fixture or member (see "welds" shown and marked "A" on illustration). The welding material is applied in the corner thus formed and finished at an angle of 45 degrees to the plate.

PLUG

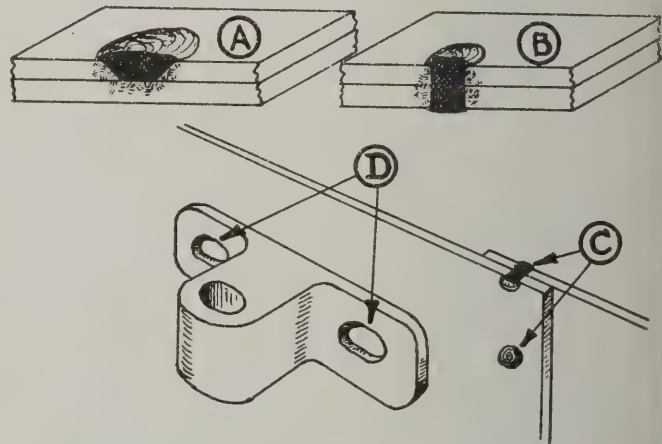
SYMBOL 

Fig. 48.—Type of Joint: Plug Weld

A plug weld is one used to connect the metals by welding through a hole in either one plate (Fig. "A") or both plates (Fig. "B"). Also used for filling through a bolt hole as at (Fig. "C"), or for added strength when fastening fixtures to the face of a plate by drilling a countersunk hole through the fixture (Fig. "D") and applying the welding material through this hole, as at (Fig. "D"), thereby fastening the fixture to the plate at this point.

on Germany. The machinery had been demolished by the crews of the ships with the hope, at least, of preventing their immediate use, and it was in general the opinion of our engineers estimating on the repairs that it would require about twelve months' time to put the machinery in service. However, under the direction of the late D. H. Wilson of the Wilson Welding and Metal Company, repairs to the various castings were accomplished by the use of electric arc welding.

After the broken out parts were cut out and edges cleaned, steel studs were fitted on the edges of the original castings and broken out parts were replaced by steel castings with edges so beveled to form a V in the original castings, and these V's were filled in with welding material. Then welding was continued from the edge of the inserted pieces to the studs previously referred to; in this way reinforcement was obtained of sufficient strength to withstand the stresses to which these parts are exposed. Due to this method of repairs the former German ships were again in service only a few

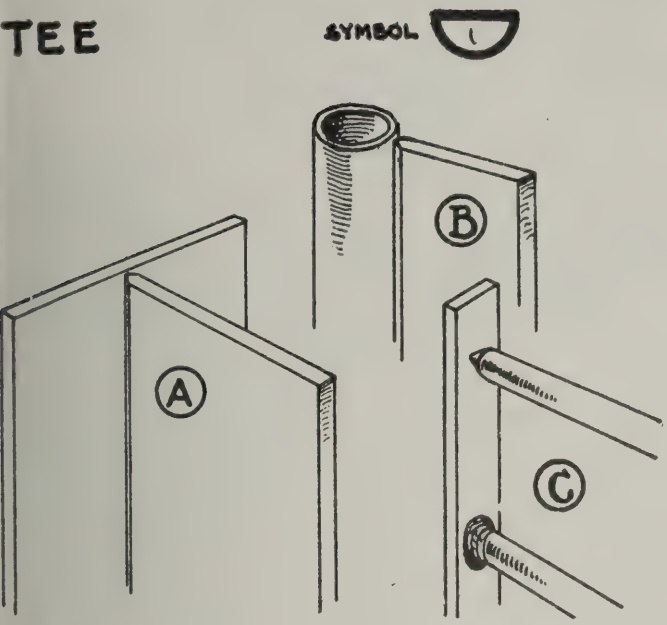


Fig. 49.—Type of Joint: Tee Weld

A tee weld is one where one plate is welded vertically to another as in the case of the edge of a transverse bulkhead (Fig. "A") being welded against the shell plating or deck. This is a weld which in all cases requires exceptional care, and can only be used where it is possible to work from both sides of the vertical plate. Also used for welding a rod in a vertical position to a flat surface, as the rung of a ladder (Fig. "C"), or a plate welded vertically to a pipe stanchion (Fig. "B"), as in the case of water closet stalls.

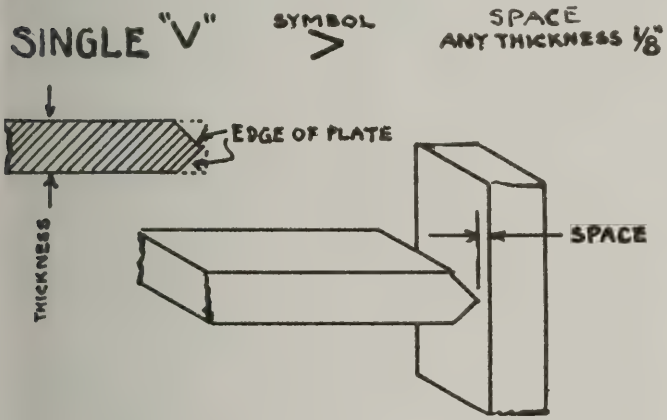


Fig. 50.—Design of Weld: Single "V"

Single "V" is a term applied to the "edge finish" of a plate when this edge is beveled from both sides to an angle, the degrees of which are left to the designer. To be used when the "V" side of the plate is to be a maximum "strength" weld, with the plate setting vertically to the face of an adjoining member, and only when the electrode can be applied from both sides of the work.

months after they had been taken over by the Government. The submarine activities prompted the British Government to fit bulges of steel construction on the outside of the shell plating at and below the water line on a large number of capital Navy ships, and these structures were to a large extent constructed by the use of the Quasi-Arc welding system.

A book could be written on the many important jobs performed during the Great War by the use of electric arc welding. Yet much more could have been accomplished had it been possible to compare data on work performed in the various shipyards as was later found by comparing work done by electric arc welding in the San Francisco plant of the Bethlehem Shipbuilding Corporation, under the guidance of Mr. J. J. Tynan, and work performed by the same company at the Fore River plant through the activities of the general manager, Mr. W. S. Wakeman. Reports and photo-prints of work performed at the various shipbuilding and

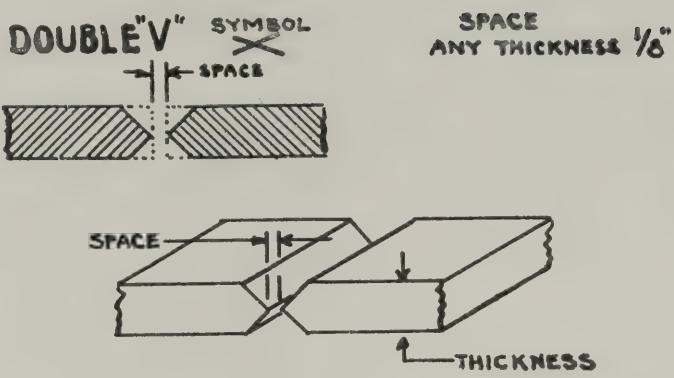


Fig. 51.—Design of Weld: Double "V"

Double "V" is a term applied to the "edge finish" of two adjoining plates when the adjoining edges of both plates are beveled from both sides to an angle, the degrees of which are left to the designer. To be used when the two plates are to be "butted" together along these two sides for a maximum "strength" weld. Only to be used when welding can be performed from both sides of the plate.

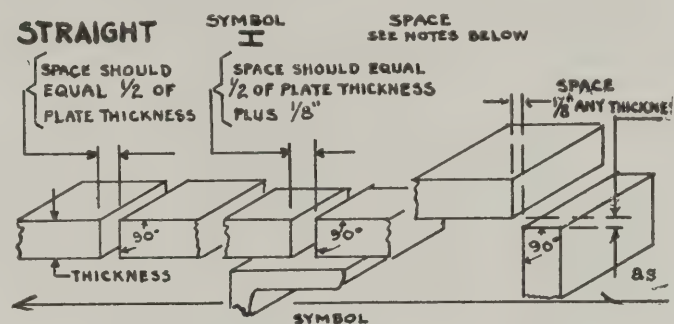


Fig. 52.—Design of Weld: Straight

Straight is a term applied to the "edge finish" of a plate, when this edge is left in its crude or sheared state. To be used only where maximum strength is not essential, or unless used in connection with strap, stiffener or frame, or where it is impossible otherwise to finish the edge. Also to be used for a "strength" weld, when edges of two plates set vertically to each other—as the edge of a box.

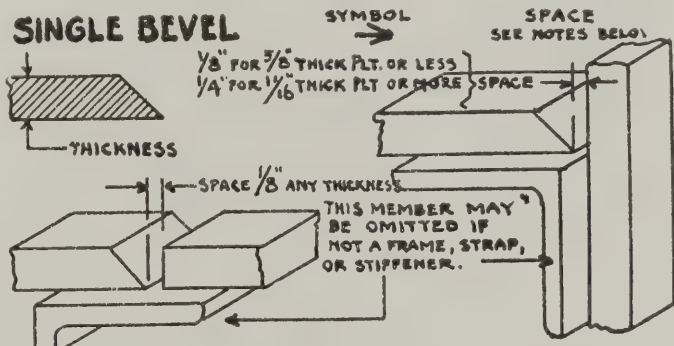


Fig. 53.—Design of Weld: Single Bevel

Single bevel is a term applied to the edge finish of a plate, when this edge is beveled from one side only to an angle, the degrees of which are left to the designer. To be used for "strength" welding, when the electrode can be applied from one side of the plate only, or where it is impossible to finish the adjoining welding surface.

ship repair plants as well as from the welding equipment manufacturers show a wonderful opportunity for this simple method of construction, and the illustrations embodied in this paper give a general idea of what can be accomplished.

SHIP REPAIR WORK

In ship repair activities there is an unlimited field for the use of electric arc welding and work has been performed by welding that would have been impractical without it. Converting a coal burning ship to an oil burning ship and fitting and making oil tight compartments for carrying the fuel oil is an extremely costly and difficult undertaking should

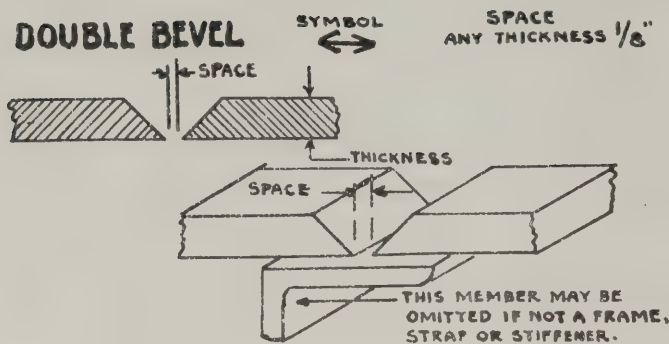


Fig. 54.—Design of Weld: Double Bevel

Double bevel is a term applied to the edge finish of two adjoining plates, when the adjoining edges of both plates are beveled from one side only to an angle, the degrees of which are left to the designer. To be used where maximum strength is required, and where electrode can be applied from one side of the work only.

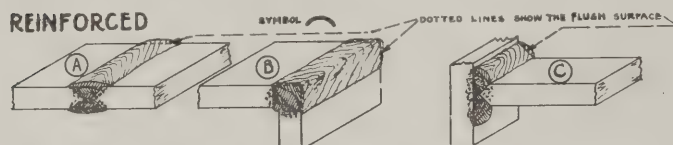


Fig. 55.—Type of Weld: Reinforced

Reinforced is a term applied to a weld when the top layer of the welding material is built up above the plane of the surrounding material as at Fig. "A" or Fig. "B" above, or when used for a corner as in Fig. "C." The top of final layer should project above a plane of 45 degrees to the adjoining material. This 45 degrees line is shown "dotted" in Fig. "C" above. This type is chiefly used in a "Strength" or "Composite" kind of weld for the purpose of obtaining the maximum strength efficiency, and should be specified by the designer, together with a minimum number of layers of welding material.

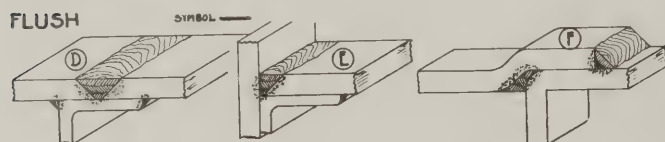


Fig. 56.—Type of Weld: Flush

Flush is a term applied to a weld when the top layer is finished perfectly flat or on the same plane as on the adjoining material as shown at Figs. "D" and "E" above or at an angle of 45 degrees when used to connect two surfaces at an angle to each other as at Fig. "F" above. This type of weld is to be used where a maximum tensile strength is not all important and must be specified by the designer, together with a minimum number of layers of welding material.

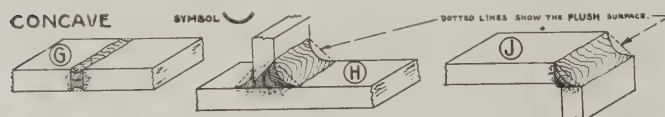


Fig. 57.—Type of Weld: Concave

Concave is a term applied to a weld when the top layer finishes below the plane of the surrounding material as at Fig. "G" above, or beneath a plane of 45 degrees at an angular connection as at Figs. "H" and "J" above.

To be used as a weld of no further importance than filling in a seam or opening, or for strictly calking purposes, when it is found that a minimum amount of welding material will suffice to sustain a specified pound square inch pressure without leakage. In this "type of weld" it will not be necessary for the designer ordinarily to specify the number of layers of material owing to the lack of structural importance.

we have to rely on riveting and calking alone, but such conversions are relatively simple today with the use of electric arc welding as was clearly demonstrated when Messrs. Armstrong, Whitworth and Company converted the Cunard company's great passenger ship *Aquitania* from coal to an oil burner.

To cut out by gas a damaged part of a ship, fit new parts or repair the parts cut out and then by welding restore it to its former place, retaining the original strength, is just what is done today by the use of electric arc welding and ship-owners are able to obtain more operating days due to cutting down the lay days necessary for repairs, by the use

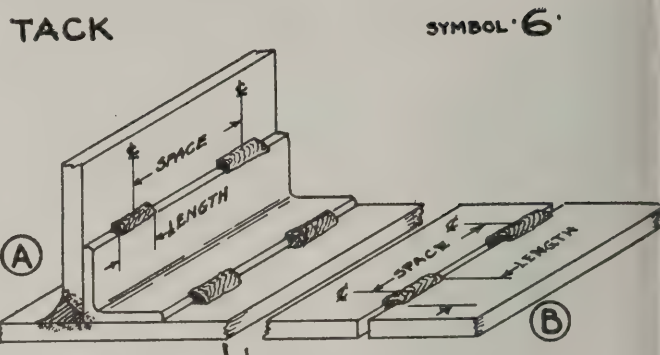


Fig. 58.—Kind of Weld: Tack

A tack weld is applying the welding material in small sections to hold two edges together, and should always be specified by giving the space from center to center of weld and the length of the weld itself. No particular "design of weld" is necessary of consideration. A tack is also used for temporarily holding material in place that is to be solidly welded, until the proper alignment and position is obtained, and in this case, neither the length, space or design of weld are to be specified.

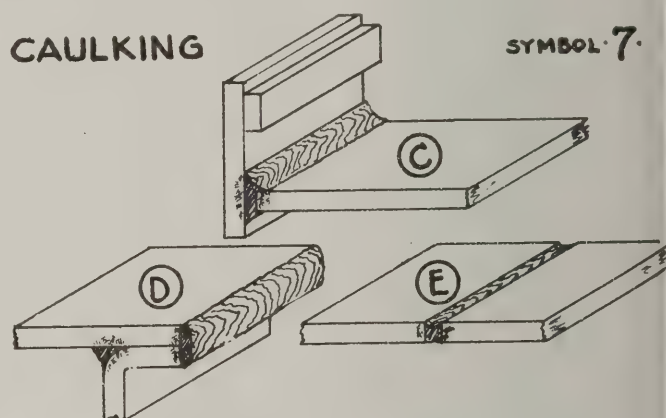


Fig. 59.—Kind of Weld: Calking

A calking weld is one in which the density of the crystalline metal, used to close up the seam or opening, is such, that no possible leakage is visible under a water, oil or air pressure of 25 pounds per square inch. The ultimate strength of a calking weld is not of material importance—neither is the "design of weld" of this kind necessary of consideration. The operator must be the judge in the number of layers needed for a tight weld, although the designer should specify a minimum amount of layers.

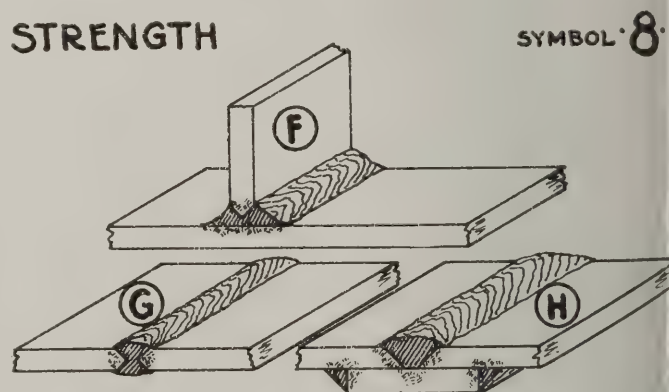


Fig. 60.—Kind of Weld: Strength

A strength weld is one in which the sectional area of the welding material must be so considered that its tensile strength and elongation per square inch must be equal at least 80 percent of the ultimate strength per square inch of the surrounding material. (To be determined and specified by the designer). The welding material can be applied in any number of layers beyond a minimum specified by the designer. The density of the crystalline metals is not of vital importance. In this form of weld, the "design of weld" must be specified by the designer and followed by the operator.

of electric arc welding. Many of the cuts and prints shown herein are of work designed for riveting, with welding substituted, while there are other cuts designed for welding, and it is by the use of the proper design that electric welding

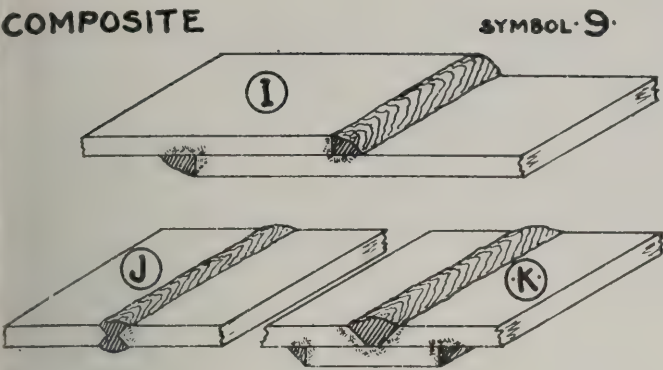


Fig. 61.—Kind of Weld: Composite

A composite weld is one in which both the strength and density are of the most vital importance. The strength must be at least as specified for a "strength weld," and the density must meet the requirements of a "calking weld" both as above defined. The minimum number of layers of welding material must always be specified by the designer, but the welder must be in a position to know if this number must be increased according to the welder's working conditions.

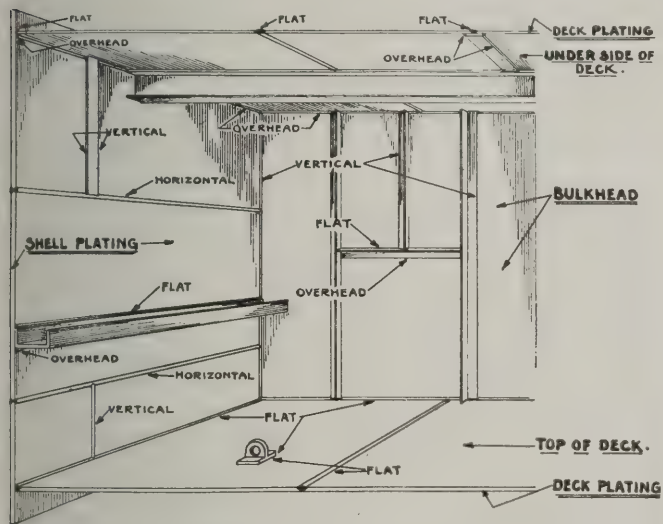


Fig. 62.—Position of Weld

Flat position is determined when the welding material is applied to a surface on the same plane as the deck, allowing the electrode to be held in an upright or vertical position. The welding surface may be entirely on a plane with the deck, or one side may be vertical to the deck and welded to an adjoining member that is on a plane with the deck.

Horizontal position is determined when the welding material is applied to a seam or opening, the plane of which is vertical to the deck and the line of weld is parallel with the deck, allowing the electrode to be held in an inboard or outboard position.

Vertical position is determined when the welding material is applied to a surface or seam, whose line extends in a direction from one deck to the deck above, regardless of whether the adjoining members are on a single plane or at an angle to each other. In this position of weld, the electrode would also be held in a partially horizontal position to the work.

Overhead position is determined when the welding material is applied from the under side of any member whose plane is parallel to the deck and necessitates the electrode being held in a downright or inverted position.

construction will be found stronger and cheaper as well as less in weight as compared with a riveted construction.

In order to simplify the work of designating types of welds on plans in the designing of detail parts, there has been developed by Mr. H. E. Knox, ex-naval constructor, a system of marking of joints for various types of welding, and it is hoped that such a system will be followed in the making of plans of ships or other structures to be constructed by the electric arc welding process.

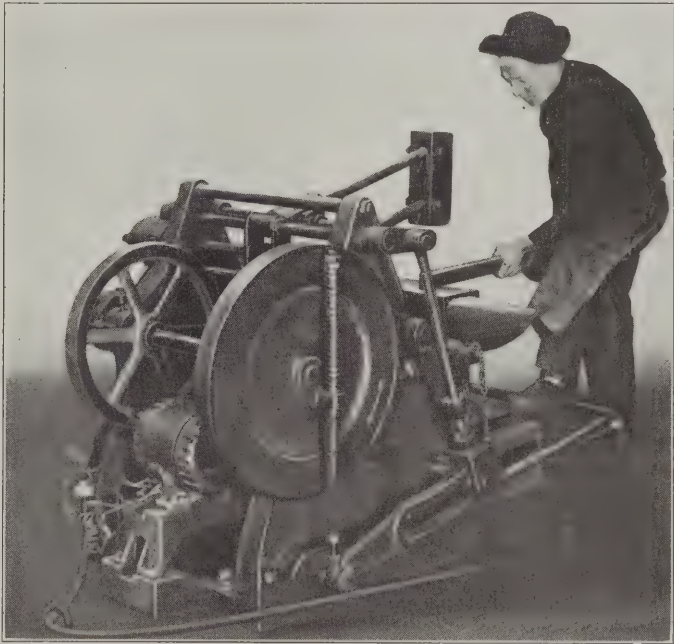
(To be continued)

During June Shipping Board steamers carried 63 percent of the cotton shipped from Gulf ports to foreign countries. The Shipping Board is now operating frequent sailings from Gulf ports to Continental Europe, United Kingdom, Mediterranean, Orient and Africa.

General Utility Power Smithing Hammer

A POWER-DRIVEN hammer intended particularly for use on forging work ordinarily performed under hand-swung sledges and too small to be done under steam hammers, is shown in the accompanying illustration. The hammer is termed a "mechanical helper," since it replaces the one or two men employed as strikers at each anvil. The same hand tools that the smith ordinarily employs are used with the hammer, without the need of special tools and dies. The hammer, which is stated to greatly increase the capacity and the output per anvil, has recently been placed on the American market by the Blacker Engineering Co., Inc., Grand Central Terminal, New York, N. Y.

The machine is rated to handle material up to 2½ inches thick, although even larger sizes can be cared for. The hammer itself is under the control of the smith, so that either a light or heavy blow can be struck. The force of the blow varies directly with the depression of the treadle extending around the anvil. It is stated that the maximum blow is about four times as heavy as that delivered by a human



Power Hammer for Forging Work

striker, and that the machine attains a rate of 140 blows per minute.

An important feature of the hammer is the lateral traverse motion that can be given to the hammer itself. This motion is controlled by a winged foot lever located at the right of the anvil and enabling the head to be traveled along the face of the anvil to the desired point.

An anvil and a block of special design to suit the hammer are furnished. The base of the anvil is planed and adjusting screws are provided on the stand, to enable the anvil to be moved forward or backward to get the proper position under the hammer.

The hammer requires only 1 horsepower to drive it. It can be run by means of a belt from a lineshaft, being furnished with tight and loose pulleys 15 inches in diameter for this work. A more compact unit is the one driven by an individual motor, as illustrated. The motor is mounted on a small stand on the base and geared to a large driving gear placed on the main shaft. The hammer alone weighs 1,300 pounds, the anvil 560 pounds, and the stand 336 pounds.

Competition for Ship Repair Contracts Keen Between British and Continental Shipyards

Labor Difficulties Hamper Work in the United Kingdom—
Repair Costs from 10 to 36 Percent Lower on the Continent

By W. H. Wendon

WITH the possible improvement in the general shipping position from now onwards—the middle months of the year are notoriously poor ones for shipowners—attention is being paid to the question of ship repairs, an elastic term which includes damage owing to weather or other “casualty,” survey commitments, or so on. In this connection the long-standing competition between United Kingdom and Continental ship repairers is again prominently to the fore. The fact is that, while the United Kingdom has recovered to a marked degree the work which, owing to lower costs in consequence of exchange difficulties, etc., Continental yards had been able to wrest from them, the position is still serious from the point of view of the United Kingdom ship repairing industry.

Apart from the rate of exchange, which is a fluctuating handicap, labor difficulties are the chief source of worry at the moment. The boiler makers, following on the attitude which resulted in the employers having no option but to lock them out, have been responsible for serious delay in repairing boats in the United Kingdom, with the consequence that vessels are constantly diverted to near-by Continental yards.

COMPARATIVE COSTS OF REPAIR WORK

Many instances have just come to light showing the extraordinary disparity between United Kingdom and Continental costs of repairs and periods in which the work can be performed. One of the most interesting is that of the *S. S. Spero*, a boat of 1,960 tons gross, which was damaged, and tenders for the repair of which were invited on account of the underwriters from two German firms, four Dutch firms, one Belgian firm and thirty-one British firms. The tender to specification of a German firm amounted to £17,500, the lowest Dutch tender was £19,500 and the highest £27,000, while the British tenders ranged from £25,800 to £34,500. The underwriters found the difference of £8,300 between the lowest British and German tenders more than their business instinct would stand, and awarded the contract to the German firm.

The placing of the work with a German firm instead of a British one had a most unexpected result. The owners of the *Spero*, the Pelton Steamship Company, of Newcastle-on-Tyne, were indignant that an ex-enemy firm should receive the contract and announced their intention of resisting the underwriters' action in placing the contract with Germans. While nothing more has been heard in regard to this unusual attitude, the incident has served to open up the whole question of repairs as affecting owners, repairers and underwriters.

A leading Lloyd's man gives an instance of the low Continental charges as compared with those quoted by British ship repairers. He states that, when tenders were called for by underwriters for the repairing of a steamer which stranded, nine tenders were received from British firms and two from abroad. The British offers were, with one exception, subject to the cessation of the boiler makers' lock-out, and the time required for the work was between 48 and 60 working days. On the other hand, the two foreign competitors offered to do the work in 32 and 28 days re-

spectively, at prices approximately 10 percent less than the most favorable, and 36 percent less than the highest, British tender.

BRITISH EMPLOYEES OBJECT TO OVERTIME WORK

One of the main factors in the trouble is that employees in the United Kingdom cannot be induced to work overtime, their main plea being that this policy would add to the ranks of the unemployed. It is pointed out to them, however, that when, owing to their action, work is diverted abroad, this entails a dead loss to this country, and it is believed that they are gradually seeing the force of this argument. Overtime is engaged in to an enormous extent in Continental yards, thus facilitating in the competition with British and other “foreigners.” There is another aspect, however, and that is that, while the Continental yards are, as I have indicated, still securing many contracts which, other conditions being equal, would find their way to United Kingdom plants, some of the prices which are being accepted abroad are such as to leave little, if any, margin for profit, so that the question arises: How long will these Continental repairers be prepared to carry on without making a reasonable profit?

Take, for example, one of the leading Dutch plants, Wilton's Engineering and Slipway Company. The directors of this concern remark that “contracts for repair work can only be secured in competition with British firms, and the prices which the company has been forced to accept have been absolutely unprofitable.” During the last financial year the company docked 367 ships, of 1,630,482 tons, while 45 ships, of 138,877 tons, were overhauled in the corporation dry docks. But, most important of all, the company was unable to pay a dividend on its ordinary shares.

The United Kingdom interests concerned are not unnaturally endeavoring to find a way out of the problem to their mutual advantage, and in this regard one prominent ship repairer emphasizes that “the British shipping industry is a trinity of factors that must support each other—the shipowner, the shipbuilder and the ship repairer—in all circumstances and difficulties.” This point has, of course, been made many times before, but there is still every absence of sign that the interests indicated intend to work in any close harmony. They would seem, on the surface, to treat each other's interests as antagonistic to their own. Or is it merely apathy?

VALUE OF STEAMSHIP TONNAGE

A guide, though rather an indirect one, has been afforded to the value of steamship tonnage by the sale by auction in London of seven Chinese-built “standard” steamers. Six of the boats were offered at one time and the other on a separate occasion. In the result, an average price of about £5 per ton on the deadweight was realized, against £36 per ton paid for the boats about four years ago while under construction. In drawing deductions from the result of this shipping sale it should be noted that the prejudice against boats of Chinese construction is understood to be reflected in the price to the extent of a depreciation of 5 or 10 percent as compared with the price of British-built vessels.

TRADE FACILITIES ACTS GUARANTEE

The guarantee, under the Trade Facilities Acts, to the Royal Mail Steam Packet Company, of a sum not exceeding £2,300,000 for expenditure in the United Kingdom on material for three ships to be built by Messrs. Harland and Wolff, Belfast, has led to the anticipated misconception in the minds of many that the guarantee is a "loan." As a matter of fact, it is nothing of the kind. The British Treasury has no power under the Trade Facilities Acts to grant loans, but only to guarantee them. The loan will be raised by the Royal Mail Company, and, to the extent to which it is guaranteed by the Treasury, will be spent by the company wholly in the United Kingdom. It is expected that the new vessels will entail an expenditure of three millions sterling, and the Government of Northern Ireland, under whose jurisdiction, of course, Belfast, where the boats are to be constructed, falls, is guaranteeing the remaining £700,000. One of the boats will be a cargo carrier of about 9,500 tons, while the others are to be passenger ships of about 20,000 tons gross, and will probably be fitted with Harland and Wolff-Burmeister and Wain Diesel engines of the new double-acting type. They are intended for the South American service.

CARRIAGE OF GOODS BY SEA BILL

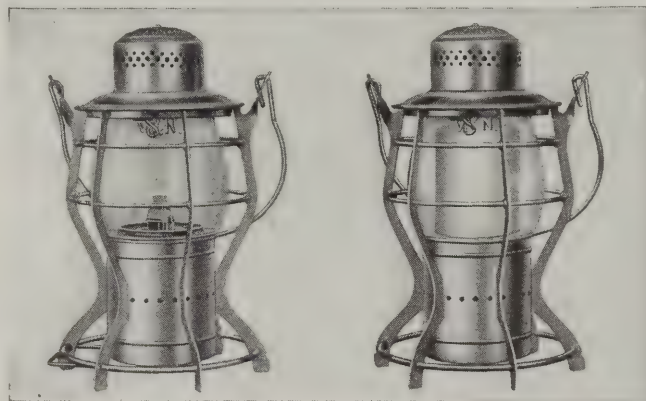
The Carriage of Goods by Sea Bill, arising out of the well-known Hague Rules, is attracting enormous interest in shipping circles, both in the United Kingdom and all over the Continent. It is permissible briefly to recall that the new legislation proposes to make compulsory in certain contracts of carriage certain rules as to liability, and to make it a criminal offence to come to an agreement not in accordance with these rules. While shipowners, and traders generally, agree that some such proposal is long overdue, there is by no means unanimity as to the need for legislation to effect the purpose aimed at. Hence, the matter has been discussed at considerable length—at the annual meeting in Gothenburg of the Baltic and White Sea Conference, before the Joint Parliamentary Committee specially appointed in the United Kingdom to consider the question, and in other quarters. A leading British shipping authority, Sir Norman Hill, secretary of the Liverpool Steamship Owners' Association, giving evidence before the Parliamentary Committee, told them that the interests of the shipping trade would be best served by permitting the parties concerned to make their own contracts, without being singled out from other concerns, to carry on their business on conditions dictated by a State department. This expert contends that, as the rules regarding sea carriage have been agreed to among the commercial community, no legislation on the matter is necessary, and that, if the rules are not adopted, it will mean that no further international maritime congress can be held. Britain, he thinks, will have made a fool of herself and be laughed at by every other country. Sir Frederick Lewis, chairman of Furness, Withy and Company, endorses Sir Norman Hill's view, but holds that, if the present Bill, which with amendments "represents the greatest common measure of agreement which the business world is ever likely to reach upon this subject," can pass into law in its present form, there is every prospect that the other great maritime nations will without delay enact similar measures.

Opposition to the Rules, from quite a different angle, has been set up by Mr. Robert Temperley, the legal adviser to the Baltic and White Sea Conference. He has carefully examined the report of the Imperial Shipping Committee, and draws the conclusion that the inclusion of "tramp" ships in the scope of the Rules was entirely due to an oversight, and that only liners were readily intended to be within their operation. He agrees that for British shipowners the time for appeal has expired, they being bound in honor to support the Government in giving effect to a pledge to the Dominions. But the Governments of the Continental maritime countries

are, so far as he knows untrammelled by any such pledge, and are free to exempt from this statutory control the bulk cargo trades. Mr. Temperley's arguments certainly meet with approval in some quarters, but in others the question is asked if such action by foreign Governments would be in the interests of British trade and shipping. Mr. Temperley, be it noted, is one of the three witnesses "named" by the Chamber of Shipping of the United Kingdom to give evidence before the Parliamentary Committee, so that the rather remarkable tenor of his views has occasioned more than usual surprise.

Double Service Lantern Adapted to
Marine Service

A LANTERN, combining the functions of a red and white lantern in a single unit, has been made available for marine use by the V. & N. Lantern Company, 256 Broadway, New York. In addition to this feature, demonstrations have shown the lantern to be practically gale proof which makes it desirable as a riding light, a deck lantern, in fact, as a general emergency light for all manner of ship service. The wick control mechanism is such that the flame can be readily adjusted in any wind. The red



The Lantern as Ordinarily Used. Right, The Red Globe in Position

globe is arranged inside the white globe on a threaded metal ring and coiled spring which works inside the shell of the lantern. This ring is controlled by a clip by means of which the red globe may be raised into position when required, or lowered out of sight in the shell.

The lantern is made from cold rolled steel or brass in various finishes—nickel, gun metal, galvanized, etc. The lantern top and lower shell are drawn from a single piece of metal, thus eliminating seams. The guard rings and frames are of heavy construction, spot welded or brazed depending on the material used. The oil font in all cases is drawn from a single piece of brass. It is designed to slip easily into the base of the lantern in any position where, when it is in place, the wick control engages with the top of the well so that when the font is rotated from the bottom, the wick is adjusted up and down. This feature makes it possible to adjust the flame without exposing it to the action of the wind. The top is equipped with a large hinge having a removable cotter pin and locks in place with a heavy spring. The handle fastens directly to the guard frame and is designed to remain in an upright position, or as desired. Either signal oil or kerosene burners are used.

All amendments to the rules and regulations of the Steamboat Inspection Service restricting the age of applicants for license to 21 years have been rescinded.



The 8,000-Ton Medon Built for the Holt Blue Funnel Line

Royal Mail Orders Two 20,000-Ton Motor Liners

To Be Propelled by Burmeister and Wain, Twin-Screw, Double-Acting, Four-Cycle Engines—New Single Screw Motorships

By Our Special London Correspondent

UNTIL about six months ago, it was not generally anticipated in British shipping circles that the oil engine would make much progress in its application to the propulsion of large passenger liners. It was thought that its field would, for some time to come, be limited to cargo ships. A change of attitude has apparently occurred, with the result that owners are not merely considering the possibilities of motor passenger liners, but are actually inclined to favor this type, in preference to the geared turbine ship.

It was therefore not entirely a matter of surprise to those who knew something of these developments to learn that the Royal Mail Steam Packet Company had ordered two 20,000-ton motor liners, which it is believed, will eclipse in luxury any they now possess. No official details have yet been published regarding the dimensions and machinery of these interesting vessels, but the writer believes the following particulars may be taken as correct.

PROPELLING MACHINERY

The length will be about 630 feet, so that these two ships will be considerably larger than the motor liner now being built on the Clyde for the Union Steamship Company, of New Zealand, and which is 600 feet in length. Twin-screw machinery will be installed, and the total power developed will be in the neighborhood of 14,500 shaft horsepower. The vessels will be built by Harland and Wolff at Belfast and the engines will be of the new double-acting, four-cycle type developed by Burmeister and Wain, for which firm Harland and Wolff are the British licensees.

These motors will have the same cylinder dimensions as the two engines to be installed in a 17,000-ton motor liner

for the Swedish Amerika Line, but instead of having six cylinders, there will be eight. Therefore, if the Harland and Wolff engines ran at the same speed as those built by Burmeister and Wain, they would normally have an output of 9,000 brake horsepower. It may be remembered, however, that in the motors now under construction for the Swedish Amerika Line's passenger boats, the air compressors are not driven directly off the engines, but that three separate compressors are to be installed in the engine room driven by a 600 horsepower Diesel engine.

In the new Royal Mail liners, a more normal system will be employed, and the air compressors—two in number—will be driven off each engine. As a result of this, combined with lower engine speed than that adopted by the Danish builders, the output of each engine will be only about 7,250 brake horsepower. The diameter will be 840 millimeters, the stroke 1,500 millimeters and the piston speed will be kept down to about 1,100 feet per minute.

PISTONS TO BE OIL COOLED

There will be a very large electrical installation as all auxiliaries are to be electrically operated. It is understood that one of the most interesting features in the design of the engines, apart from the adoption of the double acting principle, is that oil cooling will be utilized for the pistons. To the engineer who has followed Diesel engine development during the past ten years, this seems somewhat like a retrograde movement, since oil cooling was adopted many years ago and afterwards abandoned in favor of fresh water cooling in some cases, and salt water in others.

The use of lubricating oil in these large engines is the re-



The 4,400-Ton Motorship Kolsnaren

sult of some very successful trials that have been carried out on the single cylinder 1,000 horsepower unit which Burmeister and Wain built for experimental purposes. It should be remarked, however, that the oil which circulates around the piston is not actually used for lubricating. A closed circuit is maintained and the oil is utilized for no other purpose than for reducing the temperature of the piston head. It is claimed that with this arrangement the temperature can be kept down to a normal figure so as to prevent carbonization, which was one of the original troubles, and, moreover, with an entirely closed circuit the loss will be extremely small.

MANY SINGLE SCREW MOTORSHIPS

The increasing confidence which is now felt in the oil engined vessel among all classes of shipowners is reflected

in the growing number of single screw vessels of this type which are now being commissioned. There is no doubt that hitherto the employment of twin screws has been almost wholly due to the fear of unreliability, since nine ship-owners out of ten, or perhaps even a larger proportion, are greatly in favor of the installation of one engine.

A somewhat unusual single screw ship has just been completed for Alfred Holt and Company, one of the largest ship-owning concerns in Great Britain. This vessel, the *Medon*, built on the Tyne, has a deadweight capacity of 8,000 tons, is 400 feet in length and is a duplicate of several steamers owned by the same firm, so far as power and dimensions are concerned. She is fitted with a 3,000 indicated horsepower Burmeister and Wain engine, this being the biggest motor of the long stroke slow speed type that has yet been constructed, operating on the four-cycle principle. It develops



Single Screw Motorship Sally Mærsk

its power at 85 revolutions per minute whereas the normal speed for 3,000 indicated horsepower, Burmeister and Wain engines is 115 revolutions per minute.

The eight cylinders have a bore of 740 millimeters and a stroke of 1,500 millimeters. Particularly noteworthy is the arrangement for supplying the compressed air for starting and maneuvering purposes, as it is a new system which it is understood will be standardized by Burmeister and Wain.

As is well-known, in most motorships a large electrically driven maneuvering compressor is fitted. In British motor vessels of 14,000 tons with 6,000 indicated horsepower twin-screw machinery, there are two such compressors, each driven by a 180 horsepower electric motor. This is a costly plant and the new method adopted in the *Medon* is to supply the maneuvering air from the engines driving the dynamos. There are three of these sets each of 100 horsepower and the injection air compressor normally fitted is enlarged so as to give a surplus output beyond that needed for injection on the engine itself. This surplus is stored in the air reservoirs, and no auxiliary air compressor is needed. Normally, the generating sets operate in the ordinary manner, and when it is desired to charge a starting bottle, a simple change-over device is operated. This seems to mark a distinct step in the development of auxiliary equipment of motorships.

Another single screw motorship which has just been completed is the 4,400-ton *Kolsnaren* for the Transatlantic Steamship Company of Gothenburg. She is 304 feet long overall, and is propelled by a 1,600 indicated horsepower Burmeister and Wain type engine built by Gotäverken. This

also is a long stroke motor which of course was developed specially for single screw propulsion. It is interesting to note that the *Kolsnaren* is a sister ship to the *Hjelmaren* in which a two-cycle Atlas Diesel engine of the same power was fitted. Curiously enough, it is stated that the four-cycle engine occupies less engine room space than the two-cycle type fitted in the *Hjelmaren*.

A third single screw motorship completed a short time ago is the *Sally Maersk*, a 5,200-ton vessel, in which a Burmeister and Wain engine of the same power as that fitted in the *Kolsnaren* is installed. The bore and stroke are 630 and 1,300 millimeters respectively, the normal speed being 90 revolutions per minute. On trials, the *Sally Maersk* which is 331 feet long overall, and has a guaranteed speed of 10 knots, showed a fuel consumption of 4.9 tons daily. The single screw ship seems to give slightly better results than twin-screw craft, the fuel consumption being almost invariably 5 percent lower. It may be added that the *Medon* appears to be an exceptionally economical ship since her consumption works out at under 9 tons daily. This is a very good result for an 8,000-ton vessel with an average speed of approximately 11½ to 12 knots.

The Holt Line has just taken delivery of another motorship, the *Tantalus*. This is a twin-screw craft carrying about 11,000 tons deadweight, and is one of the largest of recently built motorships. Two 3,000 indicated horsepower Burmeister and Wain engines are fitted but these are of the short stroke type running at 115 revolutions per minute. The *Tantalus*, which is 477 feet long, attained a speed of about 14½ knots on trials, and it is anticipated that the fuel consumption will not exceed 20 tons daily.

Automobile Carrying Fleet Developed on Great Lakes

**Forty-One Steamships in the Trade Carry Over 250,000
Cars Per Season—Total Freight Amounts to \$5,000,000**

By Alfred C. Jackson

A NEW transportation service, with a season's revenue of over \$5,000,000, has been developed on the Great Lakes by the automobile industry and with it the city of Detroit is regaining its title as a Great Lakes port which was lost 30 years ago when the Ward Line dwindled and died. This new business is handled by a fleet of 30 freight vessels, aggregating 95,722 gross tons, together with several tramp or "casual" vessels and 11 large passenger steamers. The total premium for the marine insurance placed on the cargoes of automobiles carried in a season is based on a value of \$380,000,000.

METHOD OF LOADING

Most of the steamers used for the transportation of automobiles are provided with 'tween decks and with one or two steam winch-driven elevators which lower the cars into the hold. The speed of loading depends upon the speed of the elevator but averages about 30 cars an hour. The rate of unloading is about the same as that of loading. Side ports are generally unsuitable, as to handle all models of closed cars they must be 8 feet high which is a greater height than is permitted by the classification societies on account of the resulting weakness in the vessel's structure. Less time is required to load a cargo of automobiles than is required for many other types of cargo.

Automobiles are shipped from Detroit docks to Cleveland, Buffalo, Ashtabula, Erie, Toledo, Duluth, Milwaukee,

Chicago, Ogdensburg, Montreal, etc., and from some of these ports to other Lake ports as well. The manufacturers drive the cars to the steamship docks where they are stored in fireproof warehouses built on the piers. From the warehouses the cars are driven up an inclined runway on to the deck of the vessel whence they are lowered to the 'tween decks or hold by the elevators. When in position, the cars are placed in low speed gear with the emergency brake set and in some cases they are further secured by wheel blocks.

A list of the automobile trade fleet from Detroit, its cargo capacity per trip and the routes is as follows:

Detroit and Cleveland Navigation Company, Detroit.

Passenger boats, daily to Buffalo, 85 cars a trip.

Passenger boats, daily to Cleveland, 200 cars a trip.

Tri States Steamship Company: Cleveland, Chicago, Detroit, Milwaukee and Buffalo service, four sailings a week.

Freighter *Polynesia*, 350 cars a trip.

Freighter *Lakeland*, 310 cars a trip.

Freighter *Westland*, 240 cars a trip.

Freighter *Clifton*, 200 cars a trip.

Total: eleven hundred cars per trip.

Universal Steamship Company: Chicago-Detroit run, three sailings a week. Package freight carried from both ports as well as automobiles. Chartered steel boats.

Freighter *Spokane*, 240 cars a trip.



Lake Freighter *Polynesia*, of 5,700 Tons Deadweight, Carrying Deck Load of Automobiles. This Vessel Is Fitted with 'Tween Deck, and Elevator Can Be Seen Just Forward of After Deck House

Freighter *P. Foster*, 170 cars a trip.
Freighter *E. Oglebay*, 220 cars a trip.
Total: 630 cars a trip.

Nicholson Transit Company: Detroit, Toledo, Cleveland, Erie, Buffalo, Chicago and Milwaukee.

Steel freighter *Sultana*, 350 cars a trip.
Steel freighter *Sonora*, 350 cars a trip.
Wood freighter *Fellowcraft*, 200 cars a trip.
Wood freighter *Roumania*, 200 cars a trip.
Total: 1,100 cars a trip.

Rutland Lake Michigan Transit Company, Detroit, Ogdensburg, Chicago, Milwaukee service. Owns and will operate four steamers in the automobile and grain and package freight trade as above. Now operates three vessels and has another en route from the seacoast—the *Backbay*.

The S. S. *Burlington*, *Bennington*, *Brandon* and *Backbay* have a trip capacity of 150 cars each, or 600 cars per trip—although it is figured that they will carry only 12,000 cars a season as they have large merchandise tonnage to haul.

Great Lakes Transit Corporation: Buffalo, Erie, Cleveland, Detroit, way ports to Duluth, and from Buffalo to Chicago via Detroit, Milwaukee, etc.

Owns and operates twelve steel steamers in the automobile trade. The vessels are package freighters and carry flour on the return trips. The 12 steamers will carry 1,500 cars a trip. This firm operates three steel passenger steamers which run every three days from Detroit and carry 45 machines each trip, making a total of 1,635 cars a trip.

Crosby Line: Detroit to Milwaukee service. "This is the last line to enter the automobile carrying business.

Owns the wooden steamer *Tom Davidson*, with a trip capacity of 250 cars.

Other vessels include the *Fleetwood*, the original wooden automobile trader, 165 cars a trip, and the *Bielman*, with 260 cars a trip; also wooden steamer, and the *Tampico*, a steel ship.

The Northern Navigation Company, Detroit to Duluth, and Fort William, Port Arthur.

Three sailings per week of passenger steamers, with 50 cars each, or a total of 150 a trip.

The White Star Line, Detroit to Toledo.

Two passenger boats daily. Total, 20 cars.

Altogether, therefore, there are 41 steamers in the trade, of which only 5 are wooden vessels. Most of the lines own their own steamers and only a few charter vessels.

The trip capacity of the steamers is over 6,385 automobiles per sailing, or for the season, allowing for the carriage of package freight, etc., a total of 250,000 cars.

The revenue runs from \$10 to \$40 per car—and averages \$20 to \$25—so that a very conservative total is five million dollars freight for the season.

While the situation has brought relief to the automobile makers, and profits to the vessel owners, it has instilled real happiness in the hearts of veteran vessel men, who for years have watched with regret the stately processions of freighters move past Detroit. The vessels are now stopping at this port in increasing numbers. Detroit is again a port instead of a mail station, and the old tars are digging up their musty oil skins and beginning to stretch their sea legs.



Empress of Asia Loading Automobiles for Japan

The picture shows the Canadian Pacific liner *Empress of Asia*, loading several car loads of automobiles which she carried in her hold when she last sailed for Yokohama. Flat cars with five and six automobiles to the load came alongside the great liner. Each case weighed approximately 4,500 pounds.

Protective Coverings for Shipbuilding Purposes: Paints

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view. This is the second installment of the article on paints.

EFFORTS to produce red lead paints the pigment content of which would remain in suspension have mainly been along the lines of the addition of some inert material, such as asbestine (silicate of magnesium), to the red lead rather than attempts to produce a superior article. A number of products resulting from such efforts are on the market and they are frequently called, and may be classified as, reinforced red lead paints.

REINFORCED RED LEAD

One of these paints adopted as standard in 1918 by the War Service Committee of the Paint Industry, for general priming work on steel hulls has the following specifications:

Pigment, 65 percent.

Liquid, 36 percent.

The pigment portion shall consist of—

Red lead (not less than).....60 percent

The balance shall be silicious matter, such as aluminum silicate, magnesium silicate, silica, or a mixture thereof.

The red lead used shall contain not less than 85 percent Pb_3O_4 , the balance to be PbO .

The liquid portion shall consist of—

Pure raw linseed oil (not less than 90 percent), the balance to be combined drier and thinner. The thinner shall be turpentine.

Special requirements: The paint shall weigh not less than 16 pounds per gallon. It is intended to be used for a priming coat on steel and when applied to a smooth iron surface, it shall dry in 12 hours, without running, streaking or sagging.

During 1918 a number of well known paint manufacturers adopted the following formula for the manufacture of this kind of paint:

Pigment, 70 percent.

Liquid, 30 percent.

Pigment:

The pigment portion shall consist of not less than 80 percent red lead. The balance shall be silicious matter, such as aluminum silicate, magnesium silicate, silica or such mixtures thereof as will insure the production of a prepared red lead paint which will hold well in suspension. The red lead used shall contain not less than 85 percent Pb_3O_4 ; the balance to be PbO . The red lead is to be finely ground.

Under silicious matter $3\frac{1}{2}$ percent may be sesquioxide of iron.

Liquid:

The liquid portion shall consist of not less than 70 percent of pure raw linseed oil.

The balance of the liquid, 30 percent, shall be combined drier and thinner. Thinner will be 11 percent volatile mineral spirits.

Special Requirements:

The paint shall weigh approximately 18 pounds per gallon and is intended for general use as priming coats on steel ships and when applied to a smooth iron surface it shall dry in 12 hours under normal conditions without running, streaking or sagging.

The paint must be satisfactory in every respect, including body, freedom from objectionable settling or caking in package. Paint must also have satisfactory working qualities, hiding power, drying, color, gloss and durability.

Percentages are to be by weight unless otherwise specified.

Packages shall bear proper identification as regards certification marks.

These specifications were submitted to the Bureau of Standards who pointed out the fact that the paint contained only 10 pounds of red lead per gallon of paint, or one-half the amount in the United States Shipping Board specifications before mentioned, and stated their opinion that red lead paints are more efficient as protectors for steel in proportion to the red lead present. They also stated that they made up a paint according to the specifications and found it to be very thin. They recommended a change in the specifications for the liquid as follows:

The liquid portion shall consist of not less than 90 percent of pure raw linseed oil.

The balance of the liquid, 10 percent, shall be combined drier and thinner. The thinner may be turpentine, mineral spirits, or a mixture thereof.

A well known proprietary reinforced red lead paint has the following formula:

Pigment—57 percent. Red lead (85 percent Pb_3O_4)....80 percent

Silica and silicates.....20 percent

Vehicle—43 percent..Linseed oil 86 percent

Drier and thinner.....14 percent

Weight per gallon—14 $\frac{3}{4}$ pounds.

The general manager of a paint manufacturing company which turns out a reinforced red lead paint made up with boiled linseed oil as a vehicle told the writer he recognized it was not the paint for use on shipboard, although he had a record of very good results from the use of this paint as compared with the United States Navy standard red lead paint as an acid resisting paint and for railroad work. He realized that the marine service called for a higher proportion of pigment and a harder paint, notwithstanding their use of boiled oil for the latter purpose.

GRAPHITE

The use of natural graphite instead of asbestine with red lead produces a paint which if properly made is an improvement over the reinforced red lead paints. We may classify such a paint as a graphite paint although the pigment should be largely red lead. Graphite paint that is not made up with a large percentage of red lead and with linseed oil as the major part of the vehicle has not proved its value as a priming paint, as far as is known to the writer. A tendency with this kind of paint is to have too little pigment as, on account of the strong brown color, a very thin coat will appear to be a good coating. There is also a tendency to have the graphite too coarsely ground. The natural graphite mineral is not pure carbon and the composition of the paint will depend considerably upon the composition of the graphite. The writer believes that the following is, however, a representative analysis:

Pigment—53.4 percent Red lead (89 percent Pb_3O_4)..52.01 percent

Carbon 19.74 percent

Iron oxide 6.55 percent

Zinc oxide 2.25 percent

Silica and insoluble.....19.45 percent

Vehicle—46.6 percent Oil, mainly linseed..... 84 percent

Thinner and drier..... 16 percent

Weight 13.24 pounds per gallon.

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

This does not appear on the face of it to be an improvement over a reinforced red lead paint, but the graphite is itself a valuable pigment, as the tests referred to later show, and the principal manufacturer in this country of this kind of paint has produced a product which has been used extensively as a priming paint in the marine field with good results. This company uses a good grade of red lead and their own graphite, and the vehicle is mainly linseed oil with a small proportion of China wood oil. They claim that the graphite makes the paint more elastic than a pure red lead paint and that the China wood oil fills up the pores in the linseed oil and makes the paint more waterproof than a paint containing only linseed oil.

In the tests made by the American Society for Testing Materials artificial graphite appeared to be of little or no value as a pigment in paint designed to protect iron or steel from corrosion, and it is not to be expected that a desirable marine priming paint can be produced with all natural graphites. The graphite in the above analysis was mined in Superior, Wis.

OXIDE OF IRON

There are many paints proposed for use as priming paints which have pigments that are largely iron oxide. In actual service as priming paints they are inferior to red lead paints, and possibly the reason is the difficulty of freeing the iron oxides from soluble or injurious constituents.

Sometimes oxide-of-iron paints are made from by-products of sulphur compounds, and calcium carbonate is added to offset the evil due to the presence of the sulphur. This results in the formation of calcium sulphate, which is soluble, and possibly harmful.

One manufacturer whose paint is used extensively for structural metal work on land has added to the iron oxide chromates of lead and zinc. He states that the latter were found to be particularly valuable in resisting rust stimulation, and this appears to be substantiated by the tests referred to later on in this article.

A proprietary oxide-of-iron paint that has been considerably used as a priming paint in ship construction is said to have the following analysis:

Pigment—55 percent	Iron oxide	70 percent
	Silicious earth pigments	30 percent
Vehicle—45 percent	Raw linseed oil	50 percent
	Linseed oil, heat treated	25 percent
	Drier and volatile mineral spirits	25 percent

Another proprietary metal protective paint which is used by some shipbuilders and the pigment of which is largely Spanish Red has approximately the following analysis:

Pigment—48.0 percent	Iron oxide	56.0 percent
	Zinc oxide	10.0 percent
	Calcium sulphate	2.0 percent
	Lead sulphate	1.0 percent
	Silicates (asbestine)	24.0 percent
	Organic matter, etc.	7.0 percent
Vehicle—52.0 percent	Linseed oil	64.0 percent
	Gums	8.0 percent
	Petroleum oil	28.0 percent

Some proprietary oxide of iron paints have red lead as well as zinc oxide and other materials as a part of the pigment. Some lay great stress on a prepared linseed oil vehicle. Others do not use any linseed oil at all. An analysis of one of such paints proposed for marine service as a priming paint on steel is as follows:

Pigment—35.6 percent	Iron oxide	27.8 percent
	Red lead	24.0 percent
	Calcium sulphate	40.6 percent
	Silica	1.0 percent
	Organic matter and dye	6.6 percent
Vehicle—64.4 percent	A tung oil	resin varnish

Although the red lead in this paint by weight is almost

as large a portion of the pigment as the iron oxide, it is much less so by volume, and the calcium sulphate, as previously stated, is soluble in water. The formula as a whole looks unattractive.

About 1918 the Mare Island Navy Yard conducted experiments on paints to be used as a substitute for red lead priming paint on account of the poisonous nature of the red lead powder and the high cost of red lead and linseed oil, and met with considerable success with the following formula:

Venetian red in oil	2½ pounds
Metallic brown in oil	2½ pounds
White zinc oxide in oil	1 pound
Drier	½ gallon
Mixing oil (China wood)	⅝ gallon

The writer has not heard of any recent developments along this line.

ELATERITE

A paint made from Elaterite which has been referred to under the preceding article on "Bituminous Compositions," is proposed by its makers as a priming paint. There is no question of the value of this paint as a priming paint on inside work, where subsequent coats can be of the same material, but the writer has had no experience with it as a priming paint under other paints, and it is questionable if other paints will adhere well to it and will not be softened or discolored by it.

WHITE ZINC

This is a good pigment theoretically but it scales off of steel work.

TESTS

In 1908 the American Society for Testing Materials set up steel panels at Atlantic City which were coated with about fifty different kinds of paint. The plates had previously been cleaned by pickling. The pigments were purchased in the open market, and mixed into a vehicle consisting of $\frac{2}{3}$ gallon of raw linseed oil and $\frac{1}{3}$ gallon of boiled linseed oil. They were made up in consistencies that would allow of a uniform application at the rate of 900 square feet to the gallon, per coat. Three coats were applied. They were inspected annually in 1910 to 1914 inclusive by five inspectors, including Dr. P. H. Walker and Dr. H. A. Gardner, and graded from zero to 10 by each one, for the condition of the plate as regards corrosion and for the condition of the coating. The following table shows the average of the individual gradings at the 1914 inspection for the ten best paints as regards protection of the steel from corrosion, and for several others which are of particular interest in a consideration of priming paints on ship steel:

	Pounds Pigment Per Gallon Oil	Weight of Paint Per Gallon	Average Rating
1. Basic lead chromate	20.49	...	7.5
2. Sublimed blue lead	19.17	20.17	6.0
3. Carbon black (99 percent carbon) and nat. barytes	1.39 } 10.03 }	13.92	5.0
4. Chrome green, blue shade	13.32	16.17	5.0
5. Willow charcoal	4.47	9.00	4.5
6. Red lead	26.10	24.42	4.0
7. Natural graphite	7.80	11.42	4.0
8. Zinc chromate	10.71	13.08	4.0
9. Zinc and lead chromate	14.28	16.0	4.0
10. Black iron oxide	15.00	16.0	4.0
11. Orange mineral	26.91	24.75	3.0
12. Metallic brown	9.51	12.5	3.0
13. Bright red iron oxide	15.78	17.08	2.5
14. Venetian red	9.30	12.67	1.5
15. Zinc oxide	16.68	17.67	0 (arbitrary)
16. Asbestine	8.25	11.5	0 (arbitrary)
17. Artificial graphite (90 percent carbon)	6.63	10.5	0 (actual)

Barytes is barium sulphate and was added to give sufficient

body to the paint. The chrome green is lead chromate, lead sulphate, white lead and Chinese blue. The metallic brown is made by roasting iron ore. The bright red iron oxide is 98 percent oxide of iron (copperas red). Venetian red is made by calcining a mixture of copperas and terra alba. The other pigments have been explained or require no explanation.

Paints 3, 13 and 15 were very heavy and required to be reduced by the addition of turpentine.

Although red lead and orange mineral are pretty well down on the list it will be noted that the weight of pigment per gallon of oil is not what it should be for best results, and the amount of true red lead, Pb_3O_4 , is not stated. This test does not take into consideration the fitness of the paint as a base for other paints, the abrasive wear resisting properties of the paint, and other factors entering into the selection of a priming paint. The results are, however, of considerable interest.

The American Society for Testing Materials has also conducted tests on 19 paints on a railroad bridge at Havre de Grace, Md. The steel was coated with three coats which differed somewhat from each other along the lines of the actual use of the different kinds of paint. They were rated according to class, there being a number of classes. The only paint to retain the first class for the entire period of seven and one-half years was a pure red lead and linseed oil paint in which the red lead was 95.9 percent Pb_3O_4 . The second best paint was also a red lead and linseed oil paint, but in this case the red lead was 88.5 percent Pb_3O_4 . It remained in the first class for five years and was in the second class for the remaining two and one-half years.

GENERAL

A number of the foregoing paints are proposed as priming paints not because they are equal to the standard red lead and oil but because they can be sold at a lower price and are attractive on that account. The priming coat of paint on steel is, however, one of the worst items on which to try to save money, and the reader will probably realize this from what has been written. Where circumstances appear to merit a departure from the old stand-by, red lead, and a trial of some other make of paint, the analysis and other information here given may prove to be a guide to the probable value of the proposed paint and the result to be expected from it. It must be remembered, however, that some proprietary paints of about the same analysis may differ widely in value.

PROTECTION OF WOOD

The priming paint for the protection of wood and similar absorbent and non-corrosive materials is not so important a part of the protective coating as priming paint on steel and iron and its functions are not so varied. Its principal requirement is that it shall form a good backing and binder for the second or heavy coat of paint.

Wood absorbs the vehicle and therefore the priming paint has to be relatively thin or the oil will all go into it and leave the pigment as a dry non-adhesive coating, not suitable as a binder for the next coat. Pitchy spots do not so readily absorb the oil and for this reason as well as to reduce costs a considerable amount of turpentine is generally used, which has a solvent action on the pitch and makes the absorption more uniform. The pigment part of the priming paint is generally the same as that of the subsequent coats, except for the addition of color to the latter in some cases.

The wood should be thoroughly dry before applying the paint.

WHITE LEAD AND ZINC OXIDE

White lead either as basic sulphate or basic carbonate together with zinc oxide has been found to be the best all around pigment combination for priming coats on wood. The oil should be pure linseed oil and the entire vehicle

is the vehicle of succeeding coats, except that it is thinned with turpentine to the amount necessary to get good penetration. About 40 percent of oil and 60 percent of turpentine is a standard proportion. The turpentine, being volatile, soon evaporates. For the highest grade of interior work the surfaces are first shellacked and then painted with priming paint, well brushed into the wood, after which they are sandpapered. The further treatment will be dealt with in another article.

The old fashioned practice was to use all linseed oil and less pigment and that is probably well worth the extra cost on outside work. One old formula of this nature is as follows, the oil being boiled for outside work and raw for inside work:

White lead	7	pounds
Red lead	$\frac{1}{4}$	pound
Linseed oil	3	pints
Drier	2	ounces

The white paint adopted as standard by the United States Shipping Board Emergency Fleet Corporation has the following specifications, resulting from the work of Dr. P. H. Walker and Dr. H. A. Gardner:

WHITE PAINT

(a) The paint desired shall have a clear white color. The pigment shall have the following compositions:

Zinc oxide—not less than 25 percent nor more than 50 percent.

The remainder may be either basic sulphate—white lead or basic carbonate—white lead, or a combination of the two.

(b) If desired, there may be substituted for a part of the lead pigments either magnesium silicate, silica, barium sulphate, or calcium carbonate, or mixtures of these pigments, in amounts not aggregating more than 15 percent of the total pigment. In any event the pigment portion of the paint shall contain not less than 85 percent of total lead and zinc pigment.

(c) A trace of blue (ultramarine) may be added to make a clear white color.

(d) The vehicle shall consist of pure linseed oil, liquid drier and volatile thinner, which may be either turpentine or mineral spirits, or a mixture of these. No resin shall be present. The total volatile thinner, including that contained in the liquid drier, shall not exceed 10 percent of the total vehicle.

(e) The paint shall contain not less than 64 percent by weight of pigment and weigh not less than $15\frac{1}{4}$ pounds per gallon. The paint must be satisfactory in every respect, including body, freedom from objectionable settling or caking in can. The paint must have satisfactory working qualities, hiding power, fineness, drying, color, gloss and durability.

(f) Bidders must submit exact composition of paint they propose to furnish. Such formulas must fall within the limits prescribed above.

The inside white of the United States Navy Department, which is used for priming coats when the finish is white, often without thinning, has the same ingredients, but the white lead and zinc oxide are each 50 percent of the pigment, the pigment weight is a greater percent of the total and a gallon of the paint weighs 18 pounds. The proportions per gallon are as follows:

White lead in oil	7	pounds
Zinc oxide in oil (American)	7	pounds
Raw linseed oil	$7\frac{2}{3}$	gills
Mineral spirits	$8\frac{1}{6}$	gills
Drier	$1\frac{1}{2}$	gills
Ultramarine blue, in oil	$1\frac{1}{2}$	ounces

Where the finish is gray the Navy Department uses the same paint for priming coats as finishing coats also. It has the following formula, for one gallon:

Barium sulphate, in oil	3	pounds $11\frac{1}{2}$ ounces
Zinc oxide, in oil	4	pounds, $7\frac{1}{2}$ ounces
Lampblack, in oil	1.4	ounces, about
Linseed oil, raw	3.8	pints
Mineral spirits	$\frac{1}{2}$	gill
Drier	5	gills
Weight per gallon	15	pounds; 8 ounces

A number of the shipyards and other marine users of priming paints mix them up themselves in order to be sure of results. One shipyard uses pure white lead only as the pigment, and a vehicle that is half linseed oil and half turpentine, with a small quantity of Japan drier.

There are a number of proprietary priming paints on the market and one well known one has the following analysis:

Pigment—65.7 percent...	Lithopone	93.0 percent
	Lead sulphate.....	6.2 percent
	Silicon dioxide	.8 percent
Vehicle—34.3 percent....	Linseed oil	35.3 percent
	Mineral spirits	64.7 percent

Lithopone is a somewhat variable mixture of zinc sulphide, barium sulphate, zinc oxide and zinc carbonate. It should contain not less than 26 percent of zinc sulphide.

RED LEAD

Red lead is considerably used as a priming paint for wood in some localities and appears to be particularly valuable

where the wood is full of pitch and will not take paint well, as it is less likely to soften and blister over pitchy spots. Its color is against it if the finish is to be white, but it is not likely to affect grays or other tints. A mixture of half red lead and half white lead may be used even if the finish is white.

Dr. A. H. Sabin recommends the following formula which makes 6 gallons of paint, as priming paint for cypress, yellow pine and similar woods:

100 pounds paste red lead
1¾ gallons raw linseed oil
1¾ gallons turpentine
¼ gallon drier.

He also recommends the following which makes 7½ gallons of paint, for white pine, poplar and similar woods:

100 pounds paste red lead
4½ gallons raw linseed oil
¾ gallon turpentine
¾ gallon drier

Marine Underwriting Conditions Unsatisfactory

Annual Report of United States Salvage Association Discloses Difficulties—Syndicates "B" and "C" Make Gratifying Returns

By "Bordereaux"

DISTRIBUTION is now being made of the report of the annual meeting of the United States Salvage Association for the year 1922, just from the press. It is irrefutable evidence of the success of this great undertaking and stamps it as a factor of prime importance in the shipping life of the country. Manager Lawrence J. Brengle, of the association, reviewed the work of last year in considerable detail. He pointed out that at present underwriting conditions are far from satisfactory, due to the low value of tonnage and the complete demoralization of the foreign insurance market, "which has been willing to accept risks at rates which leave no possible chance for profit owing to the fact that the cost of repairs is still at a high level, being estimated at least 50 percent in excess of pre-war prices."

The underwriting exhibits incorporated in the report give gratifying evidence of Syndicate "B" having shown a profit for 1920 and 1921 of \$484,843.96, or 71.57 percent, after taking into consideration all expenses, including paid and estimated losses, as well as expenses of operation, which latter amount to but 3.67 percent.

The real activity of the Syndicates is shown by the business done in Syndicate "C," which has endeavored to retain at fair rates an interest in those fleets in which it was felt a reasonable profit could be made, and decline fleets on which the foreign market quoted rates which would apparently exclude any hope of profit. The profits on the 1920-1921 business may now be considered as earned, the account showing a credit balance of \$1,853,810.25, equal to 34.27 percent, after deducting all expenses including paid and estimated losses, as well as expenses of operation, which latter amount to but 1.68 percent. While the 1922 account does not at present show a profit it must be borne in mind that that year has not yet run off and that another year at least must go by before any definite figure can be known.

Salvage work of considerable extent and universal success was carried on by the Salvage Association during the past year. Important connections have been made all over the world, and facilities for useful service have been steadily increased.

Hendon Chubb, chairman of the underwriting committee of the American Marine Insurance Syndicates, in a verbal report at the meeting, expressed his views on the present status of hull underwriting in the following terms:

"The present situation in hull underwriting is indeed a very difficult one. It has been brought about by two factors: The owner has been compelled, on account of shipping conditions in general, to reduce his overhead to an absolute minimum, while, due to the increase in underwriting facilities, there has been a disposition on the part of some underwriters to grant reductions in rates and values in order to maintain or increase their premium income account.

"The general trend of the market can be appreciated by recalling the present terms on tank steamers. A well known fleet was originally placed at a 5 percent rate; the next year it was renewed at the same rate, to return 1 percent, if confined to Eastport, Demerara, and, as the vessels always traded within these limits, this was in reality a reduction in rate. The fleet is now done at 3½ percent and the values under which the individual vessels are insured have been reduced proportionately. Its record, as far as we have been able to ascertain, does not warrant this rating."

Africa Rejects Certificates

IN order to make a marine insurance certificate acceptable in South Africa it is well to have the contract contain the words, "documents to be accompanied by an insurance policy or certificate of insurance." In a recent suit at Cape Town, at which Justice Benjamin presided, the law of the Union of South Africa was declared to be the one under which the merits of the case should be construed, and not the law of the United States despite the fact that the bills of exchange had been drawn by a firm of the latter country. The drafts were each accompanied by what was known as a "through bill of lading" and a certificate of insurance. The "through bill of lading" purported to be a receipt at Leavenworth, Kansas, for carriage to Cape Town by way of certain American lines of railway to New York, and thence by the American-African Line to the port of destination, Cape Town. In his Lordship's opinion such a document could not be regarded as a bill of lading under the law of the Cape Town Province. It had been decided in England

that a bill of lading, from the earliest times, was a document which acknowledged shipment aboard a particular ship.

As regards the certificates, his Lordship observed that "they were merely certificates and not policies." These certificates, he said, had been held in England not to be policies of insurance, and as justifying the repudiation of the contract in which they had been tendered by the seller. "Both were recognized in the Union by custom. But the evidence on this point was not sufficient to prove 'custom,' which, as had been laid down by the Appellate Division, must be reasonable, immemorial and certain."

Hull Underwriters Complain

INJUSTICE is charged by certain English hull underwriters in that, despite their being charged half additional premiums on total loss reinsurances when vessels have broken trading warranties, they are nevertheless refused any return on the total loss reinsurance when the original "all risks" policy has paid one for special trading. Discussing this point an authoritative critic observes: "Had the insurance been based on the assumption that the special trade would be the one the vessel was employed in, the original rate would have been reduced by the amount of the return, and the warranties would have limited the vessel to the specific trade. Had she gone outside that trade, an additional premium would have been paid, in which the reinsuring underwriters would have participated. This would have achieved the same result as the giving of wider warranties and leaving it open to the owner to collect a return for special trade, except that the reinsuring underwriter gets an additional premium in the former case, but makes no return in the latter."

Intercoastal Coverage

THERE has been a considerable profit to underwriters in the large water-movement of freight to the East and West coasts of this country; and there have been comparatively few disasters. Much of this intercoastal trade is insured by the shippers with the carriers under the bill of lading, the carriers, in turn, declaring such insurance to their open cargo underwriters. On account of the unusual freedom from losses there has been a softening tendency in the rates for this class of business for some time past, and shippers have had no difficulty in obtaining quotations much lower than the bill of lading. Besides that, the shipper with an open policy secures a broader cover than that granted under a bill of lading, as the open policy will unquestionably cover from warehouse to warehouse, whereas the bill of lading insurance attaches and ceases at the port. It is rumored that discounts are being granted under the bill of lading insurance, and it is possible that some such method is being used by the bill of lading underwriters to meet the market tendency toward lower rates. There have been several losses of late, and should their number increase they may exert an upward tendency on the rate.

Select Dependable Carriers

TOO much importance can not be placed upon the necessity for shippers to make choice of carriers that are financially sound before entrusting business to them. There are so many dependable lines in the market that merchants have only themselves to blame if they become involved in expense and embarrassment through having been attracted to unreliable carriers by the lure of a cheapened rate. Illustrations of this necessity have of late been frequent. Recently the *Capitaine Faure*, of the Fulton Steamship Company, served to point the moral. This vessel lay at New York loaded for the Far East, but her owners found

themselves without sufficient money to forward her. The consequence was that her cargo had to be discharged, and the shippers concerned were obliged to form a committee to make arrangements for forwarding their merchandise by some other steamer. At that point in the proceedings, the case stood as an abandoned voyage, due to financial causes. There was, consequently, no liability on the part of the underwriters; but there would have been had the vessel gotten under way.

Near East Insurance

THE settlement of the Greco-Turk dispute had an important bearing on commercial routes in the Near East. The British are discussing the completion of their proposed rail line from Aleppo to Bagdad, and it is probable that Russia will proceed with the construction of the railroad through Persia to Baluchistan. Before the war, a large part of goods coming out of Northern Persia were shipped by rail to Tiflis, and thence via the Black Sea to Constantinople for transshipment to the United States. Since the war began, these shipments had to be made by way of Bagdad and Basra. As but few ocean steamers load at Basra, a transshipment is frequently made at Karachi or Bombay, thus entailing extra handling and the usual delays and hazards consequent upon transshipment. The principal shipments from Northern Persia consist of rugs, and the long caravan trip, with the possibility of fresh water damage on the voyage down the Tigris, are responsible for much more damage than in all likelihood would occur on the shorter route via Tiflis or Trebizond.

American Laws and British Cover

THE United States Circuit Court of Appeals has rendered a decision to the effect that insurance policies issued by British companies on American ships operated in or near American waters are subject to the laws of this country and not to those of England. The case was on appeal by the Marine Insurance Company, the Century, and the Employers' Liability, all of England, from the decision of the district court at Baltimore, Md. It was decided by the lower court that these companies were liable in American dollars, not in English pounds, to J. Craig McLanahan, ancillary receiver of the West India Sugar Corporation and the Equitable Trust Company, for the amount of the policies on the barge *Detroit* which was lost in a collision in the Mississippi river on August 27, 1919. At the time of the issuance of the policies a pound sterling was worth \$4.77 in American money, but when the collision occurred the rate of exchange had fallen to \$3.37. The insurance companies sought to pay the claim at the lower rate, although it was stated in the policies that a pound would be accepted at the exchange rate of \$4.75. In his opinion Judge McClintic held that the court was bound by the decision of the English Court of Appeals and the House of Lords in an identical case.

Bad Stowage Voids Policy

IMPROPER stowage of cargo constitutes negligent navigation and creates an unnecessary increase of the risk, both at common law and under a fair reading of the terms of the policy; and no recovery can be had in consequence. Such was the recent finding of the New York Court of Appeals, in affirming the judgment of the Appellate Division, Third Department, in the case of *William N. Cary and Edward L. Gailor v. the Home Insurance Company*, 235 N. Y., 296; 139 N. E., 274. In the course of the Court's sum-up citation was made of the case of *Leitch v. Atlantic Mutual Insurance Company*, wherein it was held that "one

of the conditions implied by law in case of an insurance upon cargo is that it shall be stowed in a safe and proper manner, and in the usual and customary place for the carriage of goods of the description insured, and any breach of this warranty by which the risk is varied and the perils insured against increased vitiates the policy." It was also held that it is the duty of the insured to keep the vessel seaworthy during the risk, if practicable so to do. As regards seaworthiness the Court observed that "a ship is seaworthy when reasonably fit in all respects to encounter the ordinary perils of the sea incident to the adventure insured."

Repairing One of the Largest Steel Castings in Existence

ONE of the largest Thermit welds which the Metal and Thermit Corporation has ever been called upon to supervise was recently completed on a rudder post casting for the U. S. S. *Saratoga*. This vessel was formerly under construction as a battle cruiser, but under the terms of the disarmament conference was ordered by the Government to be completed as an aeroplane carrier. The casting itself weighed 56 tons and the width of the casting at the fracture was 13 feet 6 inches. The crack extended through this entire part in an irregular line; its length, therefore, was considerably greater than the dimensions given above. The thickness of the section where the fracture occurred averaged about 3 inches, except where it passed through several reinforcing ribs about 15 inches high and through projections of about 26 inches at the top and bottom.

On the recommendation of the Penn Seaboard Steel Corporation, the Government decided to authorize a Thermit

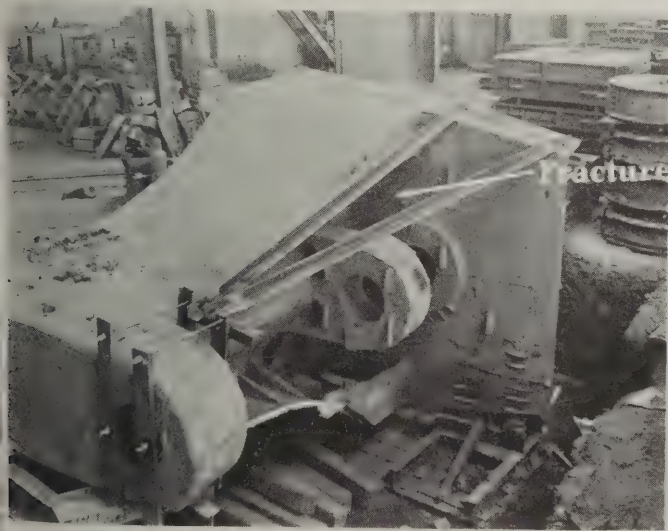


Fig. 1.—Rudder Post Laid on Its Side on Foundations in Deep Pit Preparatory to Welding

weld rather than incur the expense of making a new casting which would require about 2 months to complete and would cost in the neighborhood of \$20,000. The welding, therefore, was undertaken at the shops of the Penn Seaboard Steel Corporation at Chester, Pa.

In making preparations for welding, the rudder post casting was laid on its side in a deep pit, so as to obtain proper clearance from the overhead crane, also in order to secure greater accessibility to the upper parts during welding. In this position the break extended in a vertical plane, thus allowing the liquid steel to be poured from one crucible and permitting this steel to be gated into the mold at several points so as to secure a uniform flow of superheated Thermit metal by all parts of the fracture.

To support the casting during the welding operation a substantial foundation was built underneath it. Under the large end, a bed plate 12 feet long by 6 feet wide was laid on 12 inch by 12 inch timbers. Two layers of 12 inch I-beams were placed on the bed plate and on these I-beams, 4 inch diameter bosses on stools in turn were placed directly supporting the casting. A small bed plate 12 feet by 3 feet was placed under the small end with five layers of I-beams above the bed plate supporting this end.

The fractured end was braced vertically by means of two angles bolted to channels clamped to the lower gudgeon as shown in Fig. 1.

The gap cut out at the fracture averaged about $\frac{3}{4}$ inch wide. A total of 80 pounds of wax was used for the pattern.

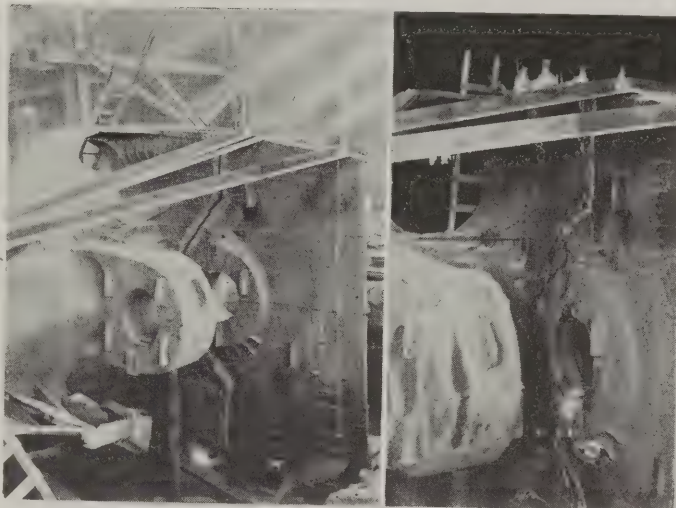


Fig. 2.—Gap Cut Out at Fracture Fig. 3.—Completed Weld

The width of the collar averaged about $4\frac{1}{2}$ inches. The wax pattern took two men twelve hours to apply.

The exceptional length of the fracture necessitated the construction of a mold box approximately 16 feet 6 inches high by 4 feet wide by 4 feet 9 inches deep. One hundred pounds of molding material were needed to fill up the mold box. Three days were required to construct the mold box and three more days to ram it.

Preheating was accomplished with seven preheating tanks including five single burner and two double burner tanks. One hundred and seventy-five gallons of kerosene were consumed in the preheating, which was started at 4 A. M. on one day and finished at 6 P. M. the same day, making an elapsed time of 14 hours.

One thousand eight hundred pounds of Thermit in one extra large crucible were used for the reaction. The weld was allowed two days to cool off gradually. Fig. 3 shows the weld with all excess metal removed.

The total length of time consumed in the welding was 15 days, extending from the time when the casting was placed in position ready for cutting out the fracture until after the mold was stripped. This period included two week-ends when no work was done on Sundays and Saturday afternoons. The repair was made by two helpers of the Metal and Thermit Corporation assisted by two helpers from the steel plant, also a man for handling the acetylene torch for cutting out the fracture and cutting the mold box sheets.

THE ATLANTIC COAST SHIPBUILDERS' ASSOCIATION has removed its offices from 1701 to 1600 Walnut Street, Philadelphia, Pa.

DOUGLAS FIR IN BRITISH WARSHIPS.—In one of the two large battleships now building for the British Navy, Douglas fir has replaced teak, according to advices received by the Department of Commerce.

New Shipping Board Wage Scale

AFTER several conferences between the representatives of the United States Shipping Board and representatives of the associations and unions of licensed deck officers, marine engineers and cooks and stewards with reference to wages and conditions on Shipping Board vessels, and after thorough investigation by the board the increases in ship wages as set forth below became effective on July 1.

In considering the matter due weight had to be given to the cost of living, the supply and demand of American labor and the maintaining of such wages and working conditions as would make for stabilization, efficiency and economy. The working out of these things in conference is in line with the established policy of the board of collective bargaining and the recognition of legitimate organizations concerned with ship personnel.

A healthy morale and satisfied and efficient crews to man and care for the ships is necessary. The co-operation and best efforts of marine labor is looked for in helping to establish permanently an American merchant marine on the seas.

DECK OFFICERS

Class of Vessel	Old Scale				
	A	B	C	D	E
Master	\$315	\$285	\$270	\$265	\$250
1st Mate	175	170	165	160	155
2nd Mate	155	150	145	140	135
3rd Mate	135	130	130	125	120
4th Mate	120	115			

Class of Vessel	New Scale				
	A	B	C	D	E
Master	\$335	\$305	\$290	\$285	\$270
1st Mate	195	190	185	180	175
2nd Mate	175	170	165	160	155
3rd Mate	155	150	150	145	140
4th Mate	140	135			

ENGINEER OFFICERS

Class of Vessel	Old Scale				
	A	B	C	D	E
Chief Engineer	\$280	\$250	\$240	\$230	\$220
1st Assistant	175	170	165	160	155
2nd Assistant	155	150	145	140	135
3rd Assistant	135	130	130	125	120
4th Assistant	120	115			
Junior Engineer	100				

Class of Vessel	New Scale				
	A	B	C	D	E
Chief Engineer	\$300	\$270	\$260	\$250	\$240
1st Assistant	195	190	185	180	175
2nd Assistant	175	170	165	160	155
3rd Assistant	155	150	150	145	140
4th Assistant	140	135			
Junior Engineer	120				

STEWARDS' DEPARTMENT

	Old Scale		Freight Vessels	
			Foreign Trade	Coastwise
Chief Steward			\$105	\$95
Steward and Cook			105	95
Chief Cook			90	80
2nd Cook and Baker			70	65
2nd Cook			65	60
Butcher			70	65
Messman			45	45
Utilityman			45	45
Deck Messboy			35	35
Engine Messboy			35	35
Stewards' Messboy			35	35

New Scale (Effective July 1, 1923)

Chief Steward			\$120	\$110
Steward and Cook			120	110
Chief Cook			100	90
2nd Cook and Baker			80	75
2nd Cook			75	70
Butcher			80	75
Messman			52	52
Utilityman			52	52
Deck Messboy			42	42
Engine Messboy			42	42
Stewards' Messboy			42	42

RADIO OPERATORS

	Old Scale		B		C	
	License	Wage	License	Wage	License	Wage
Chief Operator	1st	\$105	2nd	\$90	2nd	\$90
1st Assistant	2nd	95	3rd	70	None	
2nd Assistant	3rd	75	None		None	

	New Scale		B		C	
	License	Wage	License	Wage	License	Wage
Chief Operator	1st	\$125	2nd	\$105	2nd	\$105
1st Assistant	2nd	110	3rd	85	None	
2nd Assistant	3rd	95	None		None	

Fuel Saving Devices for Marine Boilers

ADVICES from George Nicolas Ifft, American Consul, Bergen, Norway, state that Anders Strommen, a Trondhjem marine engineer, has invented and applied for American patents on two devices for obtaining more economical utilization of combustibles under marine boilers. The inventions consist of devices for use in connection with boilers as at present installed in steamships, one by the mounting of an auxiliary fire bridge at a certain distance in front of the old fire bridge, covering the part of the grate between the fire bridges with brick work or sheet metal and supplying combustion air in an upwardly directed current through openings in a horizontal covering plate extending rearwards from the top of the old fire bridge. Practical experiments have proved that it is possible by the simultaneous application of such arrangements to obtain a very considerable improvement in the economy of the boilers.

A second device, with the same end in view, consists of mounting the fire bridge a considerable distance in front of the rear end of the fire tube, whereby the grate surface is shortened and at the same time the rear part of the fire tube is partially shut off by means of a baffle wall extending downwards from the top of the fire tube wall to within a certain distance of the bottom thereof, by which means the combustion products are deflected downwards before leaving the fire tube.

These improved arrangements do not necessitate changes in the boilers and may be applied on any boiler. The inventor claims that, in actual tests, he has secured results from 20 tons of coal equivalent to those secured from 31 tons without his device; in another case from 10 tons results equivalent to 15 tons without his device and in a third, from 15 tons, results equivalent to 19 tons without his device, the tests being made with the same kind of coal and under exactly similar conditions.

Todd School for Firemen

FREE courses of instruction for engineers and firemen in the safe and economical burning of fuel oil will be given by the Todd Shipyards Corporation at its manufacturing plant 742 East Twelfth street, New York City.

The courses will commence on August 1 and have been arranged by the Todd engineers because of the many careless and inefficient firemen working on oil burning vessels.

A few days' instruction by expert engineers, it is believed, will stimulate the interest of the men in their work and the additional knowledge they obtain will enable them to reduce the consumption of oil and thus increase the efficiency of the ships on which they work.

The courses will be along strictly practical lines and the time needed to pass an examination and secure a certificate will, of course, depend entirely on the ability of the student firemen. The instruction will include:

- Maintaining a steady temperature and pressure on the oil.
- Regulation of the air supply.
- Judging conditions by the appearance of the flame.
- How to clean strainers.
- How to light burners.
- When to clean burners.
- How to correct the little troubles that occur in the average fireroom.

Shipowners are invited to enroll their engineers and firemen.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Basic Design Problem

Q. (1,202).—I have carried out the course of procedure which you advocate in the June issue of MARINE ENGINEERING AND SHIPPING AGE, applying it to the tunnel stern vessel in the issue of April, 1921.

In preliminary calculations the value of

S corresponding to $\frac{2LAB}{H}$ is $S = 0.18$

Type of vessel—3
(ehp/EHP) $g =$
Fig. 8 v/V (type 3)
Value of v/V in article
These values I find in the upper part of Fig. 8 for $S = .19$ labeled cavitating thrusts type 2.

	0.3	0.4	0.5	0.6	0.7
Beyond curve	.666	.683	.703		
	.652	.714	.771	.822	.869

Can it be that we are using two different charts, or that the captions on the charts are deceiving?

A. (1,202).—I am afraid the difference in your readings and mine can not be charged up to misleading captions, but rather to a mistake on my part in taking values of v/V from the Type 2 instead of from the Type 1 and 3 set of lines.

Since Fig. 8 was made a new chart was gotten out by Admiral Dyson separating entirely the Type 1 and 3 from the Type 2 cavitating lines, thus permitting v/V readings down to ehp/EHP = 0 for all types of vessels.

Relative Values of Frictional and Residuary Resistance

Q. (1,206).—Please give me an idea of the relative values of frictional and residuary resistance in ships of several types.

A. (1,206).—The following data taken from page 202 Shipbuilding Cyclopaedia, Edition 1920, may be considered as representative of the results obtained in modern ships:

Type of Ship	Percentage of	
	Frictional Resistance	Residual Resistance
Destroyer	41	59
Light cruiser	50	50
Battle cruiser	59	41
Battleship	63	37
Troop transport	69	31
Fleet oiler	70	30
Cargo vessel	75	25

Passenger Capacity of Small Boat

Q. (1,205).—How many passengers may I carry on the deck of a 100-foot boat of good stability and freeboard and displacing in service condition from 70 to 80 tons without passengers?

A. (1,205).—The greatest danger in carrying passengers, particularly in a comparatively small boat, such as that described, is the possibility of their suddenly crowding to the rail and thus creating a large listing moment. To guard against serious results from this a large value of the metacentric height is desirable and a deck arrangement such as to restrain or hinder the transference of numbers of people from one side of the boat to another. Permanent ballast may be taken aboard to increase the metacentric height, if necessary.

If the boat was originally designed for passenger service, her metacentric height may be from 2 to 3 feet. Such a boat might safely carry 150 to 200 persons under ordinary river or harbor conditions. However, if the boat were not designed for passenger service and has but a small metacentric height—say one foot or fifteen inches, while she may have been very satisfactory in the service for which intended, she could perhaps carry with safety no more than 50 or 75 passengers, possibly even less.

Such a question can best be answered after a careful investigation of all the plans and stability data.

Salt Water Unsuitable for Boiler Feed

Q. (1,207).—Is it possible to keep the scale and salt out of a boiler carrying 160 pounds pressure, if you use salt water for feed? If so, how?
H. E. McF.

A. (1,207).—The writer knows of no practical means of keeping the scale and salt out of a boiler while using salt water for feed.

If salt water could be used as boiler feed without deleterious effects, the design and construction of marine steam machinery would be materially simplified.

Book on Anchors and Chain Cables

Q. (1,208).—Please give us the name of a book in which useful information regarding anchors and chain cables is given.

A. (1,208).—"Modern Seamanship" by Admiral Austin M. Knight, published by D. Van Nostrand Company, New York City, includes a valuable chapter on ground tackle. This chapter treats of types of anchors, old-fashioned and patent anchors, chain cables, details of cables, manufacture of cables, stowing, overhauling and make-up of cable, weight and strength of chain, windlasses, details of ground tackle, letting-go anchor, anchoring in squadron, anchoring in deep water, weighing, stowing of anchors, foul anchors, anchoring by the stern, riding at single anchor, advantage of long scope, dragging, mooring, advantages and disadvantages of mooring, clear and foul hawse, mooring swivel, tending ship, etc.

Materials for Anchors and Chain

Q. (1,209).—What kind of iron is suitable for anchors and chain making and what method of forging is particularly needed?

A. (1,209).—At the present time for all chain of two inches and up the United States Navy is adopting cast steel except for shackles and swivels which are to be drop-forged of a special grade of steel having a high tensile and elastic strength combined with good ductility.

Cast steel chain has also been approved by the British and American Lloyd's and is coming into use in the merchant service.

Until very recently, however, all chain cables for ships have been made of wrought iron. This material has proven suitable through years of service and is only being replaced by cast steel because cast steel chain has shown 40 percent greater strength than the best wrought iron and because cast links are more uniform in size than the forged links.

Navy Department specifications for chain cable may be

secured upon application to the Bureau of Supplies and Accounts, Navy Department, Washington, D. C.

Wrought chain for naval use is manufactured at the Boston Navy Yard. Information relative to the methods and processes of its manufacture should be obtainable therefrom.

Measurements for "Full" Displacement

Q. (1,211).—In obtaining the various coefficients, does "full" mean to the greatest outside dimension of immersed plates, or does it mean the distance to the mean thickness?

A. (1,211).—When the final calculation for displacement is made the readings may be taken either from a body plan drawn to the mean thickness of plating or from a molded body plan. In the latter case the displacement of the shell plating is estimated as an appendage and added to that of the molded hull. By either method the displacement to the mean or average thickness of the plating is obtained. Therefore, it appears logical to measure dimensions to the mean thickness of plating when calculating the value of the block coefficient for "full" displacement. However, the error introduced by using the dimensions to the outer surface of the outer strakes probably would be less than that of a good displacement calculation itself. Since coefficients are generally used for purposes of comparison the important thing is to adopt a reasonable practice and follow it consistently.

Length for "Full" Coefficient

Q. (1,212).—How is the "full" coefficient obtained, where the rudder, rudder post, propeller, etc., are included in the displacement? What length is used?

A. (1,212).—The rudder, rudder post, propellers, struts or bossing, bilge keels, etc., are usually considered appendages and their displacements are added to that of the hull proper. The augmented or "full" displacement thus obtained is used with the dimensions measured to the mean thickness of the plating. The term "full" coefficient then implies that the appendages have been considered. Theoretically the length should be taken from forward side of stem to after side of propeller or rudder post. However, no serious error (from the practical standpoint) would be introduced by using the molded length as above defined. As the coefficients of form relate essentially to the underbody proper, the inclusion of the appendages in the volume from which their values are figured is somewhat inconsistent though it is regularly done for purposes of convenience.

NEW BOOKS

Marine Directory

DIRECTORY OF SHIPOWNERS, SHIPBUILDERS AND MARINE ENGINEERS. Size, 5½ by 8½ inches. Pages, 728. The Directory Publishing Company, Limited, London, 1923.

We have just received the 1923 edition of the "Directory of Shipowners, Shipbuilders and Marine Engineers." This book, which is published annually, contains a list of the principal shipowners of the world with the addresses of their head and branch offices, the names of their ships and the names of their principal executives. It also contains a list of the shipbuilding companies with the names of their executives. This is followed by a list of consulting naval architects and marine engineers and also a list of trade organizations.

The Dock and Harbor Authority, London, has published a "Dock and Harbor Authorities' Directory" containing a list of the dock and harbor authorities throughout the world and of their principal officials.

LETTERS TO THE EDITOR

Cost of Ship Repairs

"Economy in Ship Repairs" by Mr. Robert Morell, and "Efficient Repair Methods Adopted by the United States Shipping Board" by Captain Gatewood, are two very interesting articles contributed by worthy students of their subjects. They give all that may be said from the operators' viewpoint, to whom cost of repairs represents at least 25 percent of their fixed charges. To cover the subject for the benefit of all concerned, it seems necessary to consider the repair plants, to whom cost of repairs represents 100 percent of their income. Unfortunately, successful managers of repair plants are too busy doing things to write about it, and in other cases the subject may be exceedingly painful. Having had charge of this all-important work in repair plants, as well as serving the owners in the capacity of consulting engineer on repairs, some facts may be of interest.

Economy in repairs should be studied and the high cost of repairs carefully diagnosed. Take the average shipowner; for a starter the owner personally attends to this all-important feature, but as his business grows and there is more money coming in from operation requiring his time, he spends less time and consequently more money on repairs. Rising cost of repairs causes him to make his best captain or his best chief engineer (sometimes both) remain ashore to enter the field of attending repairs. These good men, high class in their life's work as captain and chief engineer, respectively, immediately become involved in work far beyond their capacity—work that involves the expenditure of money, and they are pitted against the business end of a repair plant. It is almost unnecessary to dwell upon what happens.

The cost of a job may be known to the plant manager, but never to such an agent of the owner! The owner, therefore, gets a conglomeration of cost figures of jobs on his vessels, that would, if he could get the facts, cause a quick change to other means of attending this all-important end of his business.

There is no mystery in repair costs when one has had years of experience in costs from actual attention within the repair plant, but to expect a competent captain, or engineer, to step ashore and deal in a business that is so intricate as the repairing of a vessel, and report intelligently to its owner, is to expect something unattainable.

No owner objects to paying for work well done, or allowing a reasonable profit to be made by the repair plant, but the repair plant, forced to deal through such agencies, must protect these men in their mistakes, and both are guilty, therefore, of fooling the owner in the cost of such work. Both have good alibis. For example:

The owners' agent, having a ship repaired, overlooks essential features not included in the specifications or covered by one of those elegant and eloquent general clauses—naturally an *extra* is imminent.

God forbid any *extras*! The owners' agent is frightened into almost any method to avoid them. The repair man is asked to slip these extras in somewhere, on the next job, if necessary, thereby spoiling the opportunity of getting the real cost of any repair work on the vessel for the rest of its natural life. Neither the owners' representative nor the repair plant can report real facts to the owners for obvious reasons.

From years of experience I know wherein the cost of repairs from bills rendered has absolutely no relation to the real cost. Strange as it may seem, the cost of repairs is sometimes unknown even to the manager of the repair plant, so that the subject becomes exceedingly difficult to analyze.

Ships are as different as people and the cost of doing the

same job on different ships may in nowise be a true cost of that particular job, as there are so many contingencies that may, or may not, obtain. The best method requires fair dealing between the owners and repair plants and to my mind the owner who handles his repairs on the "live and let live" principle gets more for his dollar spent, and pays less for work done, than the "hard boiled" owner seeking to hook the repair plant on a low bid.

"Competition is the life of trade," but when competition places so valued a piece of property as a *ship* in incompetent hands, or in competent hands at too low a price, both of which comes from misguided competition, the trade becomes contaminated with a disease.

The disease may be cured!

Repair plants are as necessary as hospitals, and should be respected and encouraged as such. The prevailing attitude against all repair plants that classes the good, bad and indifferent plants and the poor, incompetent and irresponsible contractors in the same category should be eliminated.

Shipowners are operating ships to make money—they compete for cargoes on known costs of operation, so far as crew, food, fuel, insurance and overhead are concerned. They can only guess at cost of *upkeep* and *maintenance*. As repairs are unavoidable, and the cost of same a necessary item for the shipowner, more intelligence should be utilized in attending same. To know costs means closer relationship between *owners* and *repairs plants*, not through the good men previously mentioned, but through experienced men in such business.

Where owners use the right man in every branch of their operation, they use the wrong man in attending to their repairs. Any inexperienced man repairing a vessel at an established ship repair plant is doomed to incur excessive cost of repairs. There are many methods of hiding incompetency in the handling of this work—not because the incompetent man wishes to be dishonest—but it is unnatural for anyone to admit incompetency in his work, particularly where such admission may cause the loss of one's job; hence, there are many queer developments and excessive cost of jobs which are unnecessarily charged up against repair plants, and the regulation of such costs under the prevailing methods cannot be done.

The cost of such work continues to be unknown to the owner and will continue to be unknown to him just so long as present methods are used. Not until the business man, experienced in the cost of repairs, handles the repair work, so far as prices are concerned, for the owners, will the owners know the cost of such work! Considerable money may be saved by having such men attend this important feature and costs will be more properly distributed, giving thereby to the owner correct cost records.

Both Mr. Morell and Captain Gatewood are on the right track and quickly see wherein curative methods, or measures, may be effected; but it remains for most owners to realize that the best work his port captain and engineer can do is to see that the work required is properly covered, leaving the matter of cost to be handled by one who is experienced in such costs. The men to handle owners' costs are few and far between, but it remains for the owner to develop such men and to select them as they do their captains and engineers. Such men must have experience in the actual cost of repair work, and sufficient business acumen, to handle such an important business, and above all they must be of high character.

There can be no immediate result from these suggestions, but if we are to maintain our merchant marine and compete successfully for the world's transportation, some such method must be followed to realize, as soon as possible, such economies as may be effected in the cost of repairs, which will in turn lessen cost of operation.

EADS JOHNSON,
Consulting Marine Engineer,

New York.

Duties of a Marine Superintendent

In the March, 1923, issue of MARINE ENGINEERING AND SHIPPING AGE is an article entitled "The Duties of a Marine Superintendent," which, being associated very closely with that profession, was of particular interest to me and I feel prompted to amplify this subject. The article referred to, excellent though it was, did not, to my mind, fully cover the scope of a marine superintendent's duties nor the responsibilities of the position, and the fact was not brought out that the position holds with it unlimited opportunities for high grade service.

A marine superintendent of the proper sort can and should make himself the most valuable man in a steamship organization. A marine superintendent, in the true sense of the word, is not merely a port captain or a ship's husband, he is an executive charged with the entire technical, mechanical and physical upkeep and performance of the fleet. Such a man, to properly fulfill his duties, must be a high caliber business executive in addition to his technical qualifications, and must possess a versatility required of few other professions. He need not necessarily be an "old-timer"; live-wire and up-to-date methods are needed in combination with sound judgment. It is not a prerequisite that a man shall have obtained all of his experience at sea. Shipyard experience is just about as valuable as sea experience, and a combination of both is most desirable. Shipyard experience gives one an insight into the world's best marine practice, brings contact with hundreds of different vessels and problems, affords a first hand knowledge of the principles of design, construction and repair, and familiarity with shipyard methods and costs.

Beyond the few duties mentioned in the March article, the real and essential duties of a marine superintendent embody the following:

Entire field of repairs and maintenance of the fleet.

Entire physical performance of the vessels, involving all matters pertaining to engineering economy, and efficient installation and operation of the ship's power plant and other equipment.

Manning of vessels, i.e., selection of competent officers and handling crew matters, wage scale, etc.

Regulation of deck and engine stores as to selection of materials and limiting their use.

Protecting owners' interests in all accident cases.

Decision on all matters of building, purchasing or converting vessels for owners' use, with respect to size, type, characteristics and details.

Advisory to the management on general operating policy.

The above is written in the hope that it may give some marine superintendent a vision of the scope of his position and his possibilities for usefulness; a realization of his responsibilities and what is expected of him; a sense of pride in doing something really worth while.

Also in the hope that some steamship management, if they have the right man as marine superintendent, will realize that his opinion and advice are invaluable and will consult with him fully. If the judgment of the marine superintendent cannot be trusted, he is not the man for the job; get rid of him and get a man big enough to entrust with the fleet and its welfare; then give him a free hand.

MARINE SUPERINTENDENT.

Refrigerating Space Short in New York-Havre Service

Inability to obtain refrigerating space aboard ships plying in the New York-Havre service is ascribed as one of the reasons why the growing imports of frozen Canadian salmon into northern France are being transshipped through England.

PERSONAL MENTION

L. J. DUGAN has been placed in charge of the new offices of the Williams Line in Seattle, Wash.

J. R. EDWARDS has been appointed New York representative of the United States Barge Corporation of New Jersey.

ALBERTO DELLA RAGIONE has been appointed non-exclusive surveyor for the American Bureau of Shipping at Fiume, Italy.

W. B. KEENE, director of traffic, and Sidney Henry, director of sales, are now vice-presidents of the Emergency Fleet Corporation.

J. Y. S. MITCHELL, commercial agent, has been placed in charge of the new office of the Garland Steamship Corporation in Norfolk, Va.

EDWARD J. MEURER, for the past sixteen years connected with the W. & A. Fletcher Company, is now connected with the Perth Amboy Dry Dock Company.

EDWARD LOVERING, treasurer of the Massachusetts Cotton Mills, has been elected a director of the Eastern Steamship Company, succeeding J. B. Hardon, resigned.

NORRIS R. SIBLEY, formerly with the London Steam Turbine Company, has assumed new duties as representative of the firm of McClave-Brooks Company, 461 Eighth Avenue, New York.

J. B. SMULL, who recently retired as president of the Emergency Fleet Corporation, will resume activities on September 1 as a member of the firm of J. H. Winchester & Company, ship brokers and steamship agents.

ALFRED W. PARRY, JR., of the Tampa InterOcean Steamship Company, has been elected chairman of the Far Eastern Freight Conference for the next three months, succeeding Edward C. Trainor, of the Nippon Yusen Kaisha.

ARTHUR C. BESSELEVRE, at present with the United States Shipping Board, has been appointed professor of naval architecture, and Frank L. Odell has been appointed resident manager of the Webb Institute of Naval Architecture at Fordham, N. Y.

W. D. BENSON, formerly secretary of the Trans-Pacific Westbound Conference, has been named Seattle and Northwest agent for the Transmarine Corporation, which has inaugurated another intercoastal service from Port Newark to Seattle.

FLOYD N. BUSH has been appointed northwest manager of Sudden & Christenson, with offices at Seattle, his successor at Portland, Ore., being H. T. Anning, formerly in charge of the Portland office of the defunct Atlantic, Gulf & Pacific Steamship Corporation.

JOSEPH W. NEWBY, vice-president of E. E. Palen & Company, steamship agents, has been appointed general agent of the Old Dominion Transportation Company, at Norfolk, Va. Mr. Newby has been associated with the Old Dominion Steamship Company for twenty years. He will relinquish his active duties with E. E. Palen & Company, but will retain an interest and directorate in that company.

ARTHUR FLETCHER, of the W. & A. Fletcher Company, of Hoboken, N. J., in company with A. W. Preston, president of the United Fruit Company; Captain A. F. Davison, general manager of the marine department, and Mr. Moore, marine superintendent, sailed from Boston, on July 12, on the Cunard Liner *Samaria* for England. The purpose of the trip is to be present at the launching of the new steamship *La Playa* which has just been finished for the account of the

United Fruit Company by Messrs. Cammel Laird of Birkenhead, England, and is of the advanced Diesel electric drive design. The members of the party will return together to New York upon the new vessel.

J. BARRAJA-FRAUENFELDER, naval architect and marine engineer, who for the past nine years has had supervision over the high speed Diesel engine installations for the United States submarines built by the Lake Torpedo Boat Company, at Bridgeport, Conn., has resigned as chief engineer of that company. Mr. Frauenfelder has been retained by the Sun Shipbuilding and Dry Dock Company, of Chester, Pa., in the capacity of consulting Diesel engineer to undertake the development of the Sun-Doxford opposed piston Diesel engines for various commercial purposes.

OBITUARY

PETER CAHILL, eighty-two years old, founder and head of the Cahill Towing Line, Inc., died at his home in Brooklyn, N. Y., on July 18. Mr. Cahill was born in Rochester in 1841, spending his early days in that city and later in trade on the Erie Canal. He was a member of the National Board of Steam Navigators and also of the Maritime Association.

DAVID RODGERS, the best known shipbuilder on the Pacific Coast, died in Seattle, Wash., on June 25. Mr. Rodgers made an international reputation for speed in building ships during the war when he was superintendent for the Skinner & Eddy Corporation. In fact, it was probably the strain of his war-time efforts that caused his death for he had not been well for some time. Mr. Rodgers knew personally so many skilled workmen in the shipbuilding business that when the emergency building began he had little difficulty in securing the organization that helped him to make his wonderful record. Joseph E. Sheedy, vice-president, United States Shipping Board Emergency Fleet Corporation, has paid the following tribute to Mr. Rodgers:

"When the dreadful effect of the submarine employed by the Germans began to be felt so seriously and the world recognized the necessity of producing tonnage in ever-increasing amounts, it was Mr. Rodgers who first thrilled the country by delivering a complete 8,800-ton steel ship in 65 days—a year being required in pre-war days for this task.

"He thus set the pace for American yards in the production of ships, which later gained such headway that we were relieved of the frightful menace that threatened to cut off all assistance that we might render in the prosecution of the war.

"The first direct contract steel ship delivered to the United States Shipping Board was built by Mr. Rodgers and named the *Seattle*.

"Though he never sought to build ships in record time, just for the sake of establishing a record, he kept consistently cutting down the time of delivery of each vessel until he finally established 55 days as the construction time from keel laying until delivery of one of these huge vessels.

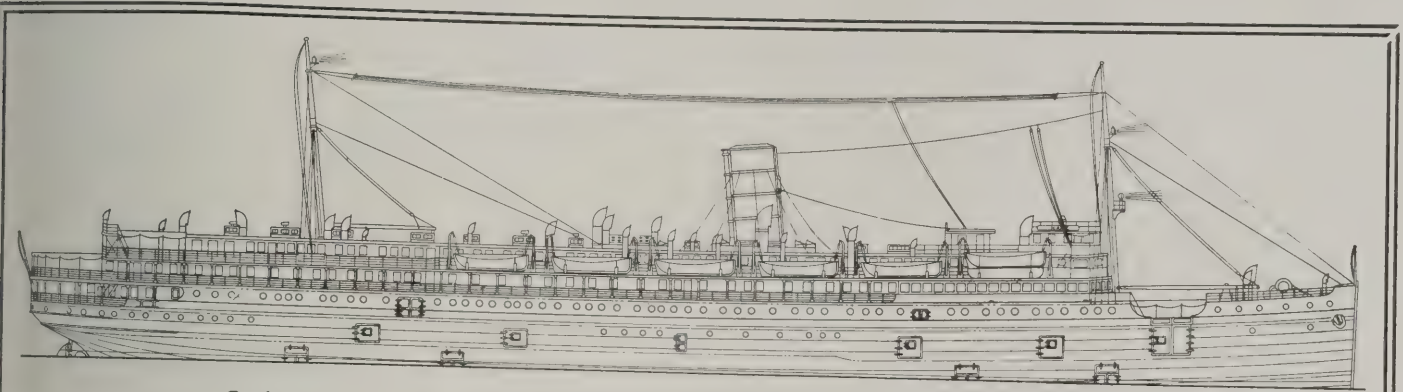
"When Mr. Rodgers was in Washington, in 1918, President Wilson sent for him and warmly congratulated him upon producing the most essential instrument of war in the record time that he had established.

"The United States Shipping Board in its untiring efforts to obtain tonnage at that time, awarded the pennant each six months to the shipyard delivering the greatest amount of tonnage based upon the number of building ways they occupied, and the Skinner & Eddy Corporation, under Mr. Rodgers' management, won this pennant on every occasion.

"Mr. Charles M. Schwab, when director general of the Fleet Corporation, named him the *Master Shipbuilder of the World*."

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries



Outboard Profile of Type "A" Ship Proposed for Clyde Line and Designed by Theodore E. Ferris

New Steamer Under Consideration

ACCORDING to well-informed circles in the shipping district, the Bridgeport and Port Jefferson Steamboat Company has in contemplation the construction of a new steel steamer for the route between Bridgeport, Conn., and Port Jefferson, New York. George M. Tooker, of Port Jefferson, is superintendent of the line. It is understood that a New York naval architect has been consulted in connection with the preparation of plans and specifications.

It is believed that a vessel having an overall length of about 165 feet will be required and the propelling machinery will probably be either turbine or reciprocating engines. The line deals principally with the carrying of passengers and automobiles and a steamer to meet the new requirements will cost approximately \$175,000.

Bids for Construction of New Clyde Passenger and Freight Ships Received

PROPOSALS for the construction of two combination passenger and freight ships for the Clyde Steamship Company were received at the office of Theodore E. Ferris, naval architect and marine engineer, 30 Church street, New York, on Monday, July 23.

Two sets of plans and specifications were given to bidders, who submitted prices for two Type "A," or large sized ship, driven by turbine engines, and two Type "B" steamers, equipped with either reciprocating or turbine propelling machinery.

DIMENSIONS

The principal dimensions of each type of ship are as follows:

"A" Type	
Length overall	425 feet 6 inches
Length between perpendiculars	410 feet 6 inches
Length for displacement	405 feet
Beam molded	55 feet 9 inches
Depth molded to hurricane deck at side	32 feet 9 inches
Depth molded to main deck at side	24 feet 9 inches
Sheer forward	7 feet
Sheer aft	3 feet 6 inches
Designed load draft	18 feet 9 inches
Deadweight carrying capacity	3,160 tons
Cargo, cubic capacity	313,000 cubic feet
Speed	14¾-15½ knots

"B" Type	
Length overall	402 feet
Length between perpendiculars	387 feet 6 inches

Length for displacement	382 feet
Beam molded	54 feet
Depth molded to hurricane deck at side	31 feet 6 inches
Depth molded to main deck at side	23 feet 6 inches
Sheer forward	6 feet 9 inches
Sheer aft	3 feet 4 inches
Designed load draft	18 feet
Deadweight carrying capacity	2,650 tons
Cargo, cubic capacity	286,000 cubic feet
Speed	15 knots

The "A" type ships are to be equipped with geared turbine engines developing 4,750 shaft horsepower, turning a single screw, while the "B" type ships are to be driven by either geared turbine or reciprocating triple expansion engines, developing 3,900 shaft horsepower and also turning a single screw.

PASSENGER ACCOMMODATIONS

The larger ship will carry only one grade of passengers—first class in rooms and steerage passengers with men berthed in open spaces and women in a limited number of rooms. The first class passengers in rooms will be about as follows: two special suites with parlor room and connecting bath (4 or 6 passengers); 16 regular suites with connecting bath (32 or 48 passengers); 16 special rooms with settee, berth and connecting toilet (32 or 48 passengers); 10 special rooms with connecting toilet, no settee berth (20 passengers); 48 regular staterooms, no settee berth (96 passengers); making a total of 150 rooms for the accommodation of from 300 to 392 passengers.

The special suites are to be fitted with twin beds and Pullman folding berth over the inboard bed; four of the regular suites are to be fitted with one double bed with Pullman berth over, and twelve regular suites are to be fitted with twin beds and Pullman folding berth over inboard bed. All special staterooms are to be fitted with settee berth, while all regular staterooms will be fitted with lower and upper metal

Bids August 13 at Nashville, Tenn., for Two Derrick Boats

THE United States Engineer Office, Nashville, Tenn., will receive sealed proposals until 11 A. M., August 13, for the construction of two derrick boats. The vessels are to have a length molded of 76 feet 6 inches, beam 34 feet, depth molded at gunwales 5 feet. The hulls are to be built of steel, each to have a transverse watertight bulkheads. Forward, there will be two spud wells fitted into the hull near the gunwales, the wells to be 20 inches by 20 inches in the

clear and one spud well will be built aft to be 15 inches by 15 inches in the clear. A total of 49 complete sheaves with bushings and 12 extra complete sheaves with bushings are to be supplied.

The boom is to be 78 feet between end pins with a 14-foot removable section in the middle. The bull wheel will have an effected diameter of 16 feet and the "A" frame heads shall be about 43 feet 3 inches above the top of the deck.

bed in one unit. The total steerage passenger capacity will be 102.

GENERAL DESCRIPTION

The "A" type ship will be of the three-deck, hurricane deck, coastwise type, with fore-castle, deck well, bridge enclosure and continuous deck erections aft, with complete double bottom; and will have lower main, hurricane, promenade and boat decks. The ships will have two steel pole masts, forward mast fitted with cargo booms and main mast fitted with a small boom, and will have one smokestack. There are to be seven watertight steel bulkheads, all extending up to the main deck and three of which, including the collision bulkhead, will extend to the hurricane deck, forming eight transverse watertight compartments. The engine and boiler enclosures will be built of steel, extending to above the top of the boat deck house. The deck house and the hurricane deck will be of steel construction and the remaining deck erections, including the entire house on the promenade deck, boat deck, wheel, chart and wireless house, will be built of wood. The ship will be equipped with fans, motors and metal ducts, intake and exhaust fans to mechanically ventilate on the balance system to the upper and lower 'tween decks in cargo spaces.

The fore peak tank will be used for fuel oil and for salt water trimming tank. The after peak tank will be used for salt water trimming tank and will also be piped for fresh water, while the double bottom tanks will carry fuel oil, water ballast and boiler feed. Culinary water, or ship tanks, will be built in aft of the ship's engine space and at each side of the engine room between the double bottom and lower deck, the deep fuel oil tanks to be built in at each side of the boiler room between the double bottom and main deck. Steam cargo winches with cranes will be fitted at all blind hatch- es (five in number on the main deck) and steam winches will be fitted forward on the main deck for working the forward cargo booms.

Amidships on the main deck will be the galley, scullery, bake shop, mess room, storerooms, wash and toilet rooms, firemen's quarters, lamp room, trunk room, dog kennel, drying room, and stewards' cold storage rooms. Aft on the main deck will be waiters' quarters and wash rooms, men's steerage quarters and toilets and steering engine room.

PROPULSION

The propelling machinery will consist of double reduction geared turbines, steam being supplied by four single-ended Scotch boilers, fitted for burning oil fuel, arranged in one fireroom, together with all necessary auxiliaries. Other equipment will include electric light and power plant, cold storage system, steam winches, steam capstans, steam windlass, steam and auxiliary steering gear, emergency lighting set, wireless equipment, mechanical ventilating system, heating system and complete ballast and draining system.

In the case of "B" type ships the construction, general appearance and arrangements will be very similar to those of the larger ship. Their passenger capacity will be approximately 116 rooms for a total of between 252 and 306 first class passengers and 86 steerage passengers.

THE BRUNSWICK-KROESCHELL COMPANY is erecting new brick and concrete factory buildings at a cost of approximately \$500,000 at Diversey Avenue and the Chicago, Milwaukee and St. Paul right-of-way in Chicago.

Shipyards Requested to Consider Completion and Conversion of Three Southern Built 7,000 Ton Steamers

ANNOUNCEMENT is made by the firm of Whittlesey & Whittlesey, naval architects and marine engineers of 17 Battery Place, New York, of the disposition of three 7,000 deadweight ton steel cargo vessels which are in various stages of completion for the Italo-American Finance Corporation, to Callahan & Atkinson Company of 17 Battery Place. The vessels are the *Torino*, *Trento* and *Trieste*. The sale com-

pletes the liquidation of the International Shipbuilding Company's plant at Pascagoula, Miss.

Callahan Atkinson Company have sent a letter to various shipbuilders, which reads in part as follows:

"We give you below the information regarding the above vessels which were built under the supervision of Lloyd's and the Bureau de Veritas at Pascagoula, Miss., which are now available for inspection and sale. The dimensions of the vessels are as follows: 385 feet 9 inches overall, 52 feet molded breadth, 27 feet 6 inches molded depth. They are designed to carry 7,000 tons deadweight on 22 feet draft.

"Hull No. 1 (the *Torino*) has reciprocating engines and Scotch boilers, and it is estimated that there is sufficient equipment available to complete the steamer. Hulls Nos. 2 and 3 (the *Trento* and *Trieste*) have considerable equipment aboard and in the yards and they are adaptable for completion as motorships. It is estimated that they will carry about 7,500 tons so completed. All can be converted into barges with an estimated capacity of about 8,000 tons.

"If you can interest any of your clients we may arrange to defer payment for these hulls until they are ready for service and we may further extend financial assistance to approved buyers. We would also consider the completion sale of these vessels on a co-operative basis, the value of the ships and material and your cost of completion being subject to mutual arrangement. These vessels, when completed, should be very desirable as colliers or for the carriage of cargo such as ore, lumber, coal, etc., on account of the shallow draft of 22 feet. The above ships represent an original investment of several millions of dollars and are offered at considerably less than the current price of tonnage."

Invitations are extended to the shipyard to have representatives inspect plans, specifications, blueprints and photographs in order to develop some plan for the completion of the ships under terms that may be mutually agreed upon.

Southern Pacific Plans Building of Two New Steamers

PLANs and specifications are expected to be completed in about a month for the construction of two combined passenger and freight ships for the Southern Pacific Steamship Company. It is believed the vessels will be used in the company's southern service.

Sullivan Company to Build New Tug

THE contract for the construction of a 95-foot steel, oil burning tug for the Southern Pacific Company has been awarded to John W. Sullivan Company, on a bid of \$112,500, and 7 months' time. Tenders were opened by A. S. Hebble, Superintending Engineer of the Southern Pacific Company, on July 17, with the following results:

John W. Sullivan Co...	\$112,500	7 months
Federal Shipbuilding Co.	129,000	180 days
Staten Island Shipbuilding Co.	129,900	180 days
Tebo Yacht & Basin Co.	135,560	185 days
Bethlehem Shipbuilding Corp.	175,000	8 months
Sun Shipbuilding Co...	187,248	195 days

West Coast Yards Bid for Over \$200,000 Worth of Reconditioning on Point Bonita and Point Adams

AT the opening of bids submitted for reconditioning the steamers *Point Bonita* and *Point Adams*, under optional purchase by the Hammond Lumber Company from the Pacific Mail Steamship Company, the lowest tender was in excess of \$100,000. The vessels are considered well suited for the coastwise lumber trade, to which service they are to be assigned by the Hammond Lumber Company, if purchased by them. The purchase price has not been revealed.

The Bethlehem Shipbuilding Corporation submitted the lowest bid on the reconditioning of the steamer *Point Bonita*, while the Moore Shipbuilding Company was low bidder for repairing the *Point Adams* for the coastwise lumber trade.

The prices submitted for the *Point Adams* were: Moore's, \$111,034 and 50 days;

Bethlehem, \$115,136 and 52 days; Hanlon \$116,512 and 50 days; General Engineering \$118,210 and 50 days; Los Angeles Shipbuilding Company, \$118,700 and 60 days, a United Engineering, \$120,250 and 60 days.

On the reconditioning of the *Point Bonita* the tenders are: Bethlehem, \$103,680 and 48 days; Moore's \$106,028 and 50 days; General Engineering, \$106,410 and 50 days; United Engineering, \$108,000 and 50 days; Los Angeles Shipbuilding Company, \$113,350 and 50 days, and Hanlon's, \$114,880 and 50 days.

The work on both ships calls for the cutting off of the shelter decks, complete overhauling engines and boilers, installing cargo gears and winches and carrying out other work, generally fitting them for coastwise lumber trade.

Hamburg-American Steamer Cleveland Bought by U. A. L.

THE report that the Harriman interests are about to acquire the former Hamburg-American Line steamer *Cleveland* has been confirmed by R. H. M. Robinson, president of the American Ship & Commerce Corporation and the United American Lines. Mr. Robinson said that the American Ship & Commerce Corporation had been in negotiation for the purchase of the ship and that these negotiations were practically completed. The sellers are the Byron Steamship Company, Ltd., of London, who have been running her recently under the British flag as the *King Alexander*.

Mr. Robinson said that the liner would be operated by the United American Lines and that she would be employed as a cabin ship in the New York-Hamburg service under her former name, *Cleveland*. He said:

"While the *Cleveland* has always carried first, second and third-class passengers and is excellently equipped to do so, it is our plan to convert her into a cabin class steamer and to make her one of the most up-to-date vessels of that type afloat. She will be thoroughly reconditioned and is expected to go into service in about two months."

The *Cleveland* is a twin-screw steamer of 17,000 gross tons, and is well known to the American traveling public, having been employed by the Hamburg-American Line in the North Atlantic service and also for round-the-world cruises.

The United American Lines maintain joint services with the Hamburg-American Line. Three first-class ships, the *Resolute*, *Reliance* and *Albert Ballin*, are now in service between New York and the channel ports and Hamburg, and this number will be increased to four when the new *Deutschland* is completed later in the year. The cabin service between New York and Hamburg, heretofore maintained with the *Hansa*, *Thuringia* and *Westphalia*, will be increased to four ships by the addition of the *Cleveland*. An exclusive third-class service is also maintained, with the steamers *Mount Clay*, *Mount Clinton* and *Mount Carroll*.

Two Navy Ships to be Fitted Out in September

The Navy Department at Washington has announced that the new battleship *West Virginia*, being built at Newport News, will be sent to Norfolk to be "fitted out" as soon as she is turned over to the department. The *West Virginia* will probably be ready for the finishing process by September.

Admiral Andrews, commandant of the Fifth Naval District, stated recently that the Navy Department expected both the *West Virginia* and *Colorado* to be ready for the final stages of fitting out by September. Both ships will stop at the Brooklyn yard for installing of fire control apparatus before going to navy yards for the final process.

The Newport News Shipbuilding and Drydock Company has charge of the building of the *West Virginia* and the *Colorado* at Camden, N. J., the work being done by the New York Shipbuilding Company. The *Colorado* will go to Philadelphia to be finished after being turned over to the Navy.

Eight Companies Bid for Six Scow Construction Contract With Pittsburgh Yard Low at \$113,220

THE Dravo Contracting Company of Pittsburgh, Pa., submitted the lowest bid for the construction of six steel dump scows at the opening of tenders by the

United States Engineer Office, Louisville, Ky., on July 16. A variety of prices were asked and eight companies submitted proposals for the work as follows:

	One scow	Two scows	Three scows	Four scows	Six scows
American Bridge Co.....					\$145,500
Nashville Bridge Co.....	\$28,940	\$57,880	\$86,280	\$114,680	170,940
Independent Bridge Co.....	27,200	49,700	71,400	92,300	134,900
Dubuque Boat & Boiler Works..	24,800	46,800	68,400	90,000	133,000
Treadwell Construction Co.....				93,000	138,000
Penn Bridge Co.....					137,250
Dravo Contracting Co.....	20,500	39,540	58,410	77,080	113,220
General Contracting Co.....		30,000			*

*Informal bid.

Chas. Ward Low Bidder for Steel Stern Wheel Tug

THE Charles Ward Engineering Works, of Charleston, W. Va., with a price of \$164,000, submitted the low bid for the construction of a steel hull stern wheel tow-boat, bids for which were opened at the United States Engineer Office, Nashville, Tenn., on July 16. There was one other bidder, the Dravo Contracting Company, of Pittsburgh, Pa., who offered a price of \$189,000.

The proposed boat is to have an overall length of 136 feet 7½ inches, breadth molded 29 feet, the propelling machinery to be of the surface condensing tandem compound type, designed for a working pressure of 250 pounds per square inch, the vessel to be modernly equipped throughout.

Bidders for Building 14 Steel Barges

THE Mississippi River Commission, First and Second Districts, Room 1006 McCall Building, Memphis, Tenn, received sealed proposals on July 18 for the construction of fourteen steel barges, the Dravo Contracting Company, of Pittsburgh, offering the lowest figure of \$192,500. The proposed barges are to have a length of 120 feet, beam 30 feet.

The tenders submitted were as follows:

Dravo Contracting Co.	\$192,500
American Bridge Company	197,400
Midland Barge Company	207,200
Independent Bridge Company	212,730
Ritter Conley Manufacturing Co.	212,800
Penn Bridge Company	224,140
Nashville Bridge Company	249,740
Dubuque Boat & Boiler Works ..	297,000
Sun Shipbuilding & D. D. Co. ..	310,000

Construction and Equipment of Pier Shed to Cost About \$889,000; Proposals to Be Taken July 30

THE Commissioner of Docks of the City of New York received bids until July 30 for the construction and equipment of the West 44th Street Pier Shed, North River, Borough of Manhattan,

under Contract 1,810, the total estimated cost being approximately \$889,000. The work is to be divided into eight separate contracts as follows:

Contract	Estimated Cost
A Construction of Pier Shed...	\$713,000
B Elevators and Appurtenances.	58,000
C Baggage Conveyors	9,000
D Gravity Chutes	12,000
E Sprinkler Systems	39,000
F Steam Heating	11,000
G Plumbing and Water Supplies.	20,000
H Electric Wiring and Fixtures.	37,000

City Considering New Ferry Plans; Steamer Bought

THE Department of Plant & Structures of the City of New York submitted to the Board of Estimate & Apportionment, recently, new plans and specifications for the construction of eight steel ferryboats, these plans and specifications now being under consideration by that board.

The Department of Plant & Structures has purchased the steamship *Colonel Clayton*, which was built for the Government during the war for inland river service but was not used. The vessel is 130 feet in length and has been bought to replace the city institutional steamer *Correction*. The *Colonel Clayton* has been awarded to the Verdon Shipbuilding Company, Staten Island, for reconditioning at a cost of about \$10,000, the total purchase and repair price being \$50,000.

New Million-Dollar Terminal Project is Planned at Norfolk

THE Mallory and Gulf & Southern Steamship interests have purchased 1,200 feet of the Hendry & Knight terminals, at Tampa, Fla., from the Carew Land Company, the purchase price and contemplated improvement entailing an outlay of about \$1,000,000. This sale is probably the largest and also the most important waterfront transaction yet made in Tampa.

American Firm to Manufacture Ljungstrom Air Preheaters

ARRANGEMENTS have recently been made by James Howden & Company of America, Inc., in conjunction with James Howden & Company, Ltd., Glasgow, Scotland, for the sole marine license of the world to manufacture the air preheater developed



Phantom View of Preheater

by Frederick Ljungström, Stockholm, Sweden. In this country the preheaters will be made at the Wellsville Works, New York, of James Howden & Company.

The advantages of preheaters in general are well known and, for some time past, air preheaters have been used in conjunction with the Howden system of forced draft. Up to the present development, such air preheaters have generally operated on the



Rotor with Heating Elements

principle of transmitting the heat from the waste gases to the air through metallic surfaces separating the air passages from the flues. Under these conditions, heat transmission is not very effective, as the temperature difference is not great and the surfaces of the heating device have a tendency to become covered with a layer of soot or tarry matter which acts as a non-conductor.

In the Howden-Ljungström preheater, the assembly of parts is such that a large transmission surface is assembled in a rotating unit so that the elements are traversed first

by the waste gases from the boiler and then by the cold air used for combustion. The gases give up their heat to the elements and as they move into the current of cold air, the stored heat is transferred to the air.

OPERATION OF PREHEATER

Referring to the phantom view of the preheater, fresh air is drawn by a fan into the upper portion of the casing, which is divided into two parts by a vertical partition. The air is confined to one side of this partition and passes downward through a similar semi-circular chamber through the body of a porous cylindrical rotor. The flue gases from the boiler traverse the apparatus in the reverse way, entering the lower semi-circular chamber and passing upward through the rotor to the upper chamber, where they are exhausted and impelled to the stack by another fan. The rotor is kept in a state of continual rotation so that the portion heated by the flue gases is continually passing to the other side of the device and giving up its heat to the cold air sweeping through it.

Since there is no transfer of heat through metal in the process, the deposits of soot and tarry matter do not seriously affect the operation of the apparatus, which, moreover, may be cleaned readily by means of a steam jet.

The rotor is built of thin sheet steel and is divided into sections by radial plates which serve as stiffeners. In each section the heat elements, consisting of special corrugated plates alternating with plain plates, are placed concentrically, thus forming when assembled a honeycomb type of structure. This design allows liberal heating surface to be provided in a heater of comparatively small dimensions and with slight obstruction to the passage of the gases and air. On the outside of the rotor a heavy steel ring is fastened against which the carrying and guide rollers work. The integral fans are fitted on a common shaft and the required speed of the roller, about six revolutions a minute, is obtained by means of suitable gearing connecting the fan shaft with the driving roller. The rollers carrying the weight of the rotor are mounted on ball bearings so that the amount of power required for driving purposes is very small.

It is claimed that from 70 to 75 percent of the heat contained in the waste gases, depending on conditions, can be recovered with the Howden-Ljungström preheater, a result which is impossible unless with a type having a large extension of the heating surface which can only be made at the expense of space and weight as well as first cost.

Test figures from a Scotch boiler burning both coal and oil and fitted with this type of air preheater show exceptionally high boiler efficiencies, ranging from 84 to 87 percent.

S. S. Porto Rico to Be Converted for Refrigeration

BIDS were opened last month by the New York & Porto Rico Steamship Company for the conversion of the steamship *Porto Rico* into a refrigeration ship, the work to be done being similar to that recently carried out on the company's steamship *San Lorenzo*. It is expected that the contract will cost over \$100,000 and that another of the line's steamers will undergo similar reconditioning at a later date. Specifications for the *Porto Rico* were issued by Theodore E. Ferris, naval architect, of 30 Church street.

TRADE PUBLICATIONS

HYDRAULIC RIVETERS.—Riveters, hydraulically actuated, applicable to all kinds of ship, plate, tank and boiler work, are described in a bulletin issued by the Hanna Engineering Works, Chicago, Ill. Illustrations and descriptions of riveters, both regular and special types, are given in sizes from the 6-inch reach, 8-inch gap, 15-ton capacity forged nose riveter to the 126-inch reach 18- to 24-inch gap, 80-ton capacity boiler riveter.

BOILER TUBE CLEANERS.—A conveniently indexed catalogue descriptive of boiler tube cleaners has been sent out by the Roto Company, Hartford, Conn. Some of the sections into which the catalogue are divided deal with cleaners for watertubes, arch tubes, fire tubes, with condenser tube cleaners, various type motors used, accessories and repair parts.

ELECTRIC STEEL CASTINGS.—A group of bulletins outlining the process of manufacturing electric steel castings and their application in industry has been collected in binder form for distribution by the Nugent Steel Castings Company, Chicago, Ill., formerly the Electric Steel Company.

SAND AND GRAVEL DREDGES.—Bulletin F-196, illustrating and describing the elevator type sand and gravel dredge designed and built by Ellicott Machine Corporation, Baltimore, Md., has recently been published by this concern. In addition to general details and specifications of the dredge, including arrangement drawings, an outline of special machinery installed, including excavators' screening machinery, winding machinery, pumps and auxiliaries is also given.

LOUD SPEAKING TELEPHONES.—The marine type Callophone designed for service on board ship, in mines, tunnels and in other places where a watertight and non-corrosive equipment is required is described in a pamphlet sent out by the Callophone Company of New York. Specifications, wiring diagrams, methods of operation with suitable illustrations explain this system.

STEAM DRIVEN COMPRESSORS.—The Ingersoll-Rand Company, 11 Broadway, New York, has just issued a 36-page bulletin describing "Imperial" type XPV Steam Driven Air Compressors. This compressor is built in a number of different types and sizes. Standard two-stage machines for 100 pounds discharge pressure, range from 246 to 4,150 cubic feet per minute piston displacement. Single-stage compressors are built for furnishing air up to 50 pounds discharge pressure. One of the outstanding features of type XPV compressors is the automatic cut-off governor which regulates the compressor. Other features of design which are illustrated and described in detail include the Ingersoll-Rand plate air valves which are used for both intake and discharge; the unit construction which requires a very simple foundation; and the automatic flood system of lubrication.

MULTISTAGE SERIES PUMPS.—A new style of centrifugal pump, called a "series pump," is described in a catalogue just issued by the De Laval Steam Turbine Company, Trenton, N. J. In this pump double suction impeller and volute diffusers are used, as in single stage centrifugal pumps. The connecting passages from stage to stage, however, are included in the pump case casting, as in the ordinary multistage pump. The advantage claimed are perfect hydraulic axial balance and high efficiency under varying loads. A is characteristic of the single stage pump.

Foreign Shipping and Shipbuilding Activities

Semi-Diesel Engines Installed in Cargo Ship Margretian

TWO 600 horsepower marine oil engines of the semi-Diesel type have recently been installed by Messrs. William Beardmore & Company in the twin screw general cargo ship *Margretian* of Cardiff. The *Margretian* is of 6,525 tons displacement, 310 feet overall length, designed for service speed of 10½ knots.

A NEW DEVELOPMENT

This installation marks an epoch in the development of the semi-Diesel engine for it is the first attempt that has been made to build other than comparatively low power units of this type. The new type Beardmore engine consists of six cylinders each 18 inches diameter by 24 inches stroke, and is rated for 600 brake horsepower at 185 revolutions per minute. Each engine is 22 feet 6 inches in overall length, 5 feet 6 inches maximum width and 7 feet high above the floor plates. It weighs complete, with fly-wheel, silencer and exhaust pipes, about 45 tons.

The engine is of the two cycle type, with crank case compression and port scavenging, and has forced lubrication to all bearings, including the pump gear. The engine drives its own auxiliaries, with the exception of the air compressor which provides the starting air.

SPECIAL FEATURES

The lubrication of this engine has received special consideration, and, contrary to the usual practice with crank case compression machines, the crank shaft bearings have forced lubrication. The oil is delivered at 10 pounds per square inch to the main bearings. From there it is fed through the shaft to the big end and thence up the connecting rod to the gudgeon pin. The return oil is led to the service tank, where it is filtered and cooled before being returned to the engine. The pistons and cylinder walls are lubricated by mechanical sight feed lubricators worked by the engine.

So far as simplicity is concerned, this engine is the equal of earlier semi-Diesel types.

French Line Plans Construction of Two Large Transatlantic Liners; Company Passes Regular Dividend

By Our Paris Correspondent

CONSIDERABLE interest has been aroused in France by the general ordinary meeting of shareholders of the Compagnie Generale Transatlantique (French Line) which was held on June 29, as apart from the questions directly connected with the management of the company in the course of 1922, Mr. Dal Piaz, chairman of the board of the French Line, dealt in a very comprehensive speech with various questions pertaining to the present position of the shipping trade in this country and the general overseas policy of France.

The returns and accounts of the company

for the last year are far from being satisfactory since the total receipts amounted to 282,986,860 francs only, while the total of the expenditures for the same period was 262,781,341 francs: after deducting various charges, the net profit for the year under review works out to 155,821 francs only, and the board thus proposed that no dividend should be paid to shareholders, which proposal was agreed to by the shareholders.

Mr. Dal Piaz stated that the amount of the subvention which is granted to the company by the French Government in respect of the management of the mail service on the Havre-New York line has grown obviously insufficient in view of the increase in charges of all kinds which has been observed in the course of the last few years. For this reason the company has requested the Government to agree to a revision of the agreement of 1913 which still regulates the conditions of the subvention of the Government in that respect. A draft bill has been recently submitted to the Chamber of Deputies and it is hoped that the discussion thereon will take place in Parliament in the near future; such bill provides for a notable increase of the amount of the subvention.

At the same time Parliament will have to ratify the granting of a special subvention to the French Line which will enable them to place an order for a large new liner to be placed in service on the Havre-New York line in 1926. A second liner to be delivered in 1932 should be ordered by the company shortly after the first one. It is probable that these two liners will be ordered from the Chantier et Ateliers de Saint-Nazaire (Penhoet) which built the *Paris* and the *France*. These two liners should be built on the same lines as the *Paris*, in view of the satisfactory results obtained in service with the latter, which is a quadruple screw, turbine driven, oil burning vessel. The cost of these vessels should work out to about 100,000,000 francs each.

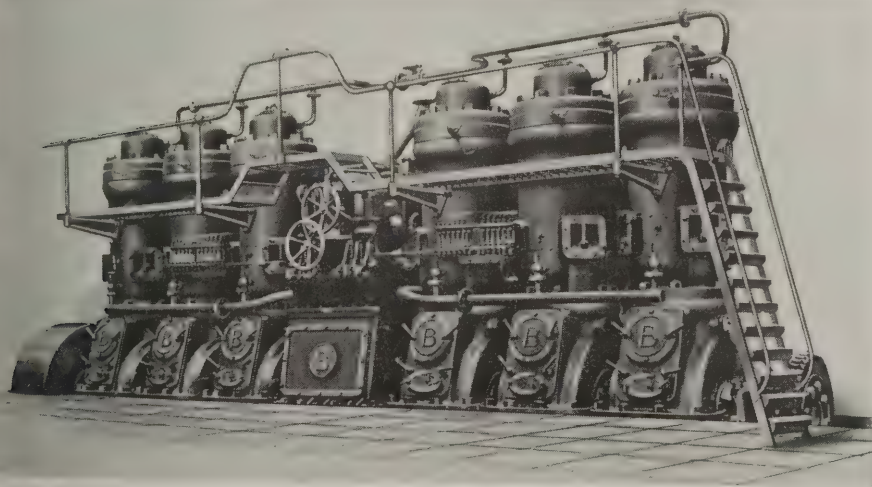
That the financial outlook of the company is improving is shown by the fact that the receipts for the first six months of 1923 have been 17 percent higher than for the corresponding period of 1922 while the expenditures have shown no increase.

French to Build Submarines Under New Naval Budget

THE 1,000,000,000 franc (\$62,500,000) naval budget voted upon by France recently provides for four 2,400-ton long distance cruising submarines. These submarines will cost at least 30,000,000 francs (\$1,875,000) each, construction probably being started this year. The budget also provided money for thirty 1,100-ton submarines to cost 15,000,000 francs (\$937,500) each.

The French navy now has about fifty submarines in service, including a number of good German submarines.

Owing to the nation's limited financial resources and also the restrictions of the Washington treaty, the French naval ministry wishes to increase the submarine program, and some money provided in the new budget for other craft will likely be devoted to laying down new submarines.



600 Horsepower Beardmore Marine Semi-Diesel Engine

Fiat Company Takes Over Turin Diesel Engine Works

TURIN, Italy.—Control of the Turin Diesel Engine Works, Via Cuneo, 20, formerly owned by the Ansaldo San Giorgio, has been acquired by the Fiat Company, original founders of the plant, which will carry on the business without change of personnel under the name of Fiat-Stabilimento Grandi Motori. The company will specialize in the construction of heavy oil, two-cycle engines for both marine and industrial purposes.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPBUILDING AND REPAIRS

Extensive Damage Work, Toledo, O.—The damaged steamer W. B. Schiller has been taken to Toledo for extensive repairs.

Contract Awarded, Baltimore, Md.—The lightship No. 52 has been awarded to the Spedden Shipbuilding Company for docking and repairs.

Steamer Drydocked, Chester, Pa.—The steamship W. D. Anderson has been drydocked at the Sun Shipbuilding & Dry Dock Company's yards, Chester, Pa.

Steamer Repairs, Cleveland, O.—The steamer S. J. Murphy, which broke her crankshaft on Lake Superior recently, has been towed to Cleveland for repairs.

Plate Repairs, Buffalo, N. Y.—The G. M. Wilson, a Boland & Cornelius boat, is in the Buffalo Dry Dock for repairs. Twenty-two plates are being replaced.

Tug Repairs, Jacksonville, Fla.—The tug Adler, of the Corona Coal Company of New Orleans, was taken to the Merrill-Stevens Dry Dock Company for repairs.

Nine Steel Barges, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company is constructing nine steel barges for the Tennessee Coal and Iron Company.

Collision Damage Repairs, Buffalo, N. Y.—The steamer Duluth, which received damages recently in a collision, is being repaired at the Ranahan Shipyards.

Steamer Repairs, Baltimore, Md.—The Shipping Board has awarded the contract for repairs to the steamer Monmouth to Theodore H. Rohde, Inc., at a bid of \$5,635.

Conversion to Oil Burner, San Francisco, Cal.—The Dollar Line steamer Stanley Dollar was awarded to the Bethlehem Shipbuilding Corporation, at a price of \$27,186.

Steamer Drydocked, Chester, Pa.—The American steamship Conejos has been drydocked at the Sun Shipbuilding and Drydock Company's yards, Chester, for miscellaneous repairs.

Vessel Repairs, San Francisco, Cal.—At the opening of tenders for repairs to the steamer West Isip, the Main Iron Works, San Francisco, Cal., submitted the lowest bid.

Plate Repairs, Lorain, O.—The steamer Secand-bee, recently damaged when it hit an obstruction in the Great Lakes, has been taken to Lorain for repairs to damaged plates.

Broken Propeller Repairs, Charleston, S. C.—The steamship West Iris, a Shipping Board vessel, has been taken to the Charleston Navy Yard to have a broken propeller blade replaced.

Voyage Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was low bidder for voyage repairs to the steamer Elkridge, of the Shipping Board, at a price of \$380.

General Reconditioning, Baltimore, Md.—The Curtis Bay Towing Company's tug Port Covington has been placed on the ways of the H. E. Crook Company for general reconditioning.

Cleaning and General Repairs, San Francisco, Cal.—The sea fighter Pennsylvania has been placed on the ways of the Bethlehem Shipbuilding Corporation for cleaning and general repairs.

Repair Work, Portland, Ore.—The steamer Pawlet, lighthouse tender Manzanita, for repairs; tug F. A. Douty, for repairs to propeller and to have her wheel fitted, were placed on the St. Johns drydock.

Ferryboat Launched, Buffalo, N. Y.—The new Grand Island ferry was launched recently and the finishing touches are now being completed by the Erie Basin Shipyards. The boat has been named the H. W. Long.

Contract Awarded, Kearny, N. J.—The contract for overhauling and general repairs to dredge No. 9, of the P. Sanford Ross Company, of Jersey City, has been awarded to the Federal Shipbuilding Company, at an approximate price of \$16,000.

Vessel Repairs, Philadelphia, Pa.—The Cramp Shipbuilding Company is making repairs on the coastwise tug Prudence and Government dredge Orleans. The Shipping Board steamship Western Spirit is also being repaired at the same yard.

Smooth Planked Dory, Staten Island, N. Y.—Sealed proposals were received by the Superintendent of Lighthouses, Tompkinsville, Staten Island, N. Y., on July 24, for a 20-foot smooth planked Swampscott dory, equipped with gasoline engine.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation received the following contracts: Admiral line steamer Admiral Farragut, general overhauling; transport Meiggs, general hull repairs; tankers Argyll and Lebec, general repairs.

Freighter Launched, Cleveland, O.—The American Shipbuilding Company recently launched the freighter Charles M. Schwab at Cleveland. The vessel has a length of 600 feet and is of 14,000 deadweight tons. She will be the largest boat in operation on the Great Lakes.

Shipyard Activities, West Coast.—The Eureka Boiler Works was low bidder for engine repairs on the liner Venezuela, of the Pacific Mail Company, and the United Engineering Company submitted the lowest figure for general repairs on the vessel, the prices being \$554 and \$681, respectively.

Lightship Repair Bids, Oakland, Cal.—At the opening of proposals for reconditioning Lightship No. 83 the Hanlon Drydock and Shipbuilding Company tendered a bid of \$4,099. Other bids for the work were: Moore's, \$4,230; De Young's, \$4,786; General Engineering, \$5,179, and Bethlehem, \$5,550.

Steamers Drydocked, Chester, Pa.—Steamer Steel Navigator, of the Isthmian Steamship Line, has been drydocked at the Sun Shipyard, Chester, for miscellaneous repairs prior to going to a Far East berth. The West Irmo has also been drydocked at the same yard for miscellaneous repairs and painting.

Shipyard Work, Mobile, Ala.—The steamship Gaston, for renewal of keel shoeing, etc.; repairs on the West Corum; steamship Normania repairs; boiler repairs on Fruit steamship Venator, and miscellaneous overhauling of the steamship Edgefield, have been awarded to the Alabama Dry Dock and Shipbuilding Company.

Low Bidder, San Francisco, Cal.—The General Engineering and Drydock Company was low bidder at the opening of tenders for repairs to the Government vessel George Armistead, which were as follows: General Engineering, \$2,174; Smith & Scanlon, \$2,321; Moore Drydock Company, \$2,357, and Hanlon Shipbuilding and Drydock Company, \$2,513.

Large Repair Contract, Oakland, Cal.—The Moore Drydock & Shipbuilding Company received the contract for making repairs to the boilers, renewal of nine furnaces and other general engine room repairs, to the Moore & McCormack Company, Inc., inter-coastal steamer Commercial Guide. The tender submitted by the Moore Company was around \$47,000.

Shipyard Activities, West Coast.—The General Engineering Company received the contract for repair work on the steamer Meton, the following bids having been submitted: General Engineering, \$5,883; Crowley's, \$6,369; Smith & Scanlon, \$6,770; Main Iron Works, \$6,300; Moore Drydocks, \$6,510;

Bethlehem, \$6,269, and United Engineering Company, \$6,555. For scaling the vessel, the same company was also low, with a price of \$4,775.

Ferryboat Launched, Wilmington, Del.—Pusey Jones, Wilmington, Del., have launched the steamer ferryboat Chelsea, which has been building for the Philadelphia & Reading Railway for service between Camden and Philadelphia. The boat is 22 feet long, 65 feet wide. Her sister ship, the Ocean City, now on the ways, will be completed in a few months.

Bids for Barges, Memphis, Tenn.—The Mississippi River Commission, First and Second Districts, Room 1006, McCall Building, Memphis, Tenn., received sealed proposals on July 18 for the construction of fourteen steel barges, the Dravo Contracting Company, of Pittsburgh, offering the lowest figure of \$192,500. The proposed barges are to have a length of 120 feet, beam 30 feet.

Lifeboats, Etc., Oakland, Cal.—The Pacific Boat and Manufacturing Company, of Oakland, has been awarded a contract by the army transport service for the construction of eight lifeboats and whale boats. The vessels will be of the latest design, equipped with life-saving equipment. The company recently delivered six lifeboats for the Southern Pacific Company for the new steamer Sacramento.

Shipyard Activities, Oakland, Cal.—The Hanlon Shipbuilding and Drydock Company was awarded the contract for extensive reconditioning of Hartwood Lumber Company's vessel Avalon, consisting of the installation of a new tail shaft, r lead sleeve and extensive engine and hull repairs as well as caulking. The revenue cutter Calhoun will go on drydock for repairs when the work on Avalon is completed.

Extensive Reconditioning, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, Mobile, was awarded the following ship work: Steamer Cabrille, for examination, opening up of all engine boilers and auxiliaries for inspection, outside scaling, four coats of paint, etc.; steamer Venator, repairs; steamer Gaston, tug Coloso, miscellaneous repairs; and steamer W. land, plate repairs, decks calked, engine repairs, etc.

Two Ferryboats Reconditioning, Oakland, Cal.—Ferryboat Cazadero, owned by the Northwest Pacific Company, is being entirely reconstructed at Oakland shipyards, at a cost of \$200,000, to render it in condition for increased passenger and mobile service between San Francisco and Sausalito. The Old Thoroughfare, of the Southern Pacific Company is also being rebuilt at the company yard, to operate between Oakland and San Francisco.

Vessel Contracts, Panama Canal Zone.—The following vessels were recently taken to the Cristobal shops for repairs: launch Dalia, repairs to shaft, stern bearing, caulking deck seams, etc.; steamship Ulysses, scale and paint hold; marine D-3, remove bow rudder, overhaul 10 gun clean and paint all tanks, and several other important repairs; tug Tavernilla, mineplanter ham, steamships Acajutla, District of Columbia, Heffron, Balboa, Oriana, Ucayali, Cristobal, etc.

Contract Awarded, Baltimore, Md.—Under proposals received and opened at the office of United States District Engineer at Philadelphia, Pa., on June 22, the contract for four 50-foot motor tugs has been awarded to the Spedden Shipbuilding Company, of Baltimore, Md., the low bidder for the four tugs combined at a total of \$112,337, based on the installation of Kalberg 100-horsepower engines. Delivery of the tugs will be accepted by the United States at the yard of the contractor.

Repair Work, Buffalo, N. Y.—The Oldman-Miller Boiler Works, Buffalo, are completing repair

the steamer Usona, of the White, Mitchel & Gratiwick Line. They are rebuilding her hatches and deck and overhauling the boiler. The same yard has completed overhauling boilers of the British Ship Belchers. Repairs are being made at the Riley Dry Dock Company to Barge No. 214, of the New York Canal & Great Lakes Corporation, four new plates, caulking and replacing of 500 rivets comprising the necessary work. New stern planks have been installed in Barge 501 belonging to the same company.

Bids for Sternwheel Towboat, Memphis, Tenn.—The Charles Ward Engineering Works, of Charleston, W. Va., with a price of \$164,000 submitted the low bid for the construction of the steel hull stern wheel towboat, bids for which were opened at the United States Engineer Office, Nashville, Tenn., on July 16. There was one other bidder, the Dravo Contracting Company, of Pittsburgh, Pa., who offered a price of \$189,000. The proposed boat is to have an overall length of 136 feet 7½ inches, breadth molded 20 feet, the propelling machinery to be of the surface condensing tandem compound type, designed for a working pressure of 250 pounds per square inch, the vessel to be modernly equipped throughout.

Shipyard Activities, West Coast.—The United Engineering Works tendered the lowest bid for general voyage repairs to the U. S. transport Grant, the prices submitted being as follows: United Engineering, \$1,423; Hanlon's, \$1,672; A. De Young, \$1,713; Bethlehem, \$1,738; Neptune Metal Works, \$1,897; and Moore's, \$1,987. The West Chopaka was discharged from the Bethlehem yard after completing cleaning and painting. The Mauna Ala is on the Bethlehem ways for cleaning, painting and to have her propeller changed; the Mexican steamers Oaxaca and Chihuahua were discharged from the Union Iron Works after undergoing repairs, and the Manoa and Sonoma are on the ways of the Bethlehem Shipbuilding Company for repairs. The Hanlon Shipyards are busy on the schooner Fred J. Wood and the steam yacht Virgana.

PORT IMPROVEMENTS

Sea Wall, etc., Greenwood, Miss.—Plans are being made for a sea wall on the left bank of Yazoo River. \$15,000. W. S. Hawkins, engineer.

Grain Elevator, Hopkinsville, Ky.—Acme Mills plan 40 by 100-foot grain elevator, 100 feet high, reinforced-concrete, 200,000 bushels capacity. To exceed \$25,000.

Levee, Waxahachie, Tex.—Ellis Company, Levee District II, plans to reclaim 1,500 acres, levees on North Side of Chambers Creek. \$52,000. W. H. Stovall, county judge.

Dredging, Huron, Mich.—U. S. Engineer, Detroit, awarded the contract for dredging Black River Channel, Port Huron, to Port Huron Sulphite & Paper Company. \$12,700.

Grain Elevator, etc., Pelican Rapids, Minn.—H. E. Frazee is having plans prepared for a grain elevator and feed mill, brick and concrete. \$40,000. Duvar & Milinowski, 500 Globe Building, St. Paul, architects.

Hydraulic Dredging, etc., Key West, Fla.—Paul Boyesen Development Company has had estimates made on 150,000 cubic yards of hydraulic dredging and fill. \$37,500. B. Curry, Moreno, and P. Boyesen, Key West, engineers.

Channel Changes and Excavation Plans, Sioux City, Ia.—The city is making plans for changing the channel of Perry Creek, 50,000 cubic yards of excavation, etc. \$335,000. L. N. Hintgen, Sioux City, engineer.

Estuary Work, Tampa, Fla.—The City Commissioners of Tampa, Fla., have awarded the contract for the work of constructing the new municipal port terminals on the Ybor estuary to McGuckin, McGuckin & Edwards, of Tampa.

Contract Awarded, Ottawa, Ont.—The Department of Public Works, Parliament Building, Ottawa, Ont., awarded the contract for dredging in the harbor of Ft. William and Port Arthur, to J. S. Pratt, Midland. Estimated cost \$300,000.

Dock and Terminal, Portland, Ore.—The Oregon, Washington Railway and Navigation Company, Velle-Fargo Building, plans new Albina Street dock, \$228,000, and terminal, \$197,488. S. Murray, assistant chief engineer, in charge of the work.

Bulkhead Award, Pensacola, Fla.—Specification 4837. Bureau of Yards and Docks, Navy Department, Washington, D. C., awarded the contract for replacing bulkhead at Naval Air Station, to C. H. Turner, 12½ South Palafox street. \$31,994 (240 days).

Pier, San Diego, Cal.—Sealed proposals were received by City Council, July 11, for constructing a portion of mole type pier project, including concrete wharves, also sides and ends of pier wall. \$300,000. F. G. White, Ferry Building, San Francisco, engineer.

Grain Elevator, Fort Worth, Tex.—Fort Worth Elevator Company, 1510 East 1st street, awarded the contract for a reinforced-concrete grain elevator, 1,750,000 bushels capacity, to Southwestern Engineering Company, Woodruff Building, Springfield, Mo. \$1,500,000.

Wharf and Dock, Detroit, Mich.—The Public Lighting Commission, Atwater street, East, awarded the contract for a reinforced-concrete wharf and dock, at site of proposed lighting plant, to Greiling Brothers, 100 Blk. East Walnut street, Green Bay, Wis. \$417,400.

Piers, San Francisco, Cal.—State Board of Harbor Commissioners, Ferry Building, is having preliminary plans prepared for three piers, from 285 feet to 350 feet wide and from 1,200 to 1,500 feet long, with sheds 115 feet wide. F. G. White, Ferry Building, chief engineer.

Air Compressor, etc., for Grain Elevator, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Court Building, July 19, for furnishing an air compressor and receiver for the public grain elevator. Requisition G. E. 1445.

Dike, etc., Biron (Wisconsin Rapids P. O.), Wis.—Consolidated Water Power & Paper Co., Wisconsin Rapids, awarded a contract to Rood Construction Company, Wisconsin Rapids, for a 2-mile dike, 100,000 cubic yards, approximately 10,000 cubic yards of rip rap, 10,000 cubic yards of rock excavation, in connection with drainage project.

Dock and Boat Basin, Sanford, Fla.—The contract for furnishing for a dock and boat basin, 24,000 cubic yards of hydraulic sand fill, 1,750 cubic yards of reinforced-concrete, 35,000 lineal feet of wood piling, 76,000 pounds of steel, 11,000 feet creosoted timber, etc., was awarded to the Interstate Contracting Company, Sanford, at a price of \$68,887.

Hydraulic Dredging, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, at their office, Suite 200, New Court Building, July 26, for hydraulic dredging from 750,000 to 1,500,000 cubic yards in the Inner Harbor Navigation Canal between the Lock and Louisville and Nashville Railroad bridge. J. H. Walsh, general manager.

Sea Wall or Flood Protection, Vicksburg, Miss.—Sealed proposals for the construction of a concrete wall along the river front at Vicksburg, Mississippi, were received at the City Hall, July 2, approximately 4,200 lineal feet of wall containing about 9,500 cubic yards of concrete, 450 tons of reinforcing steel and 4,200 lineal feet of interlocking sheet piling 10 to 20 feet long, being contained in the work.

Slip to Be Enlarged, Baltimore, Md.—The slip at the Merchants & Miners Transportation Company's docks is to be dredged out twelve feet further back towards Bay street, steel piling and a concrete bulkhead will then be installed and the whole slip dredged to the same depth. This work is being done by the company to facilitate the loading and unloading of its two new ships, the Alleghany and Berkshire.

Inlet Improvement, Fort Pierce, Fla.—A bond issue of \$220,000 has been authorized for the improvement of the Fort Pierce Inlet to provide a channel depth of 14 feet and extend the jetties a sufficient distance east and west to adequately protect the project. The Fort Pierce Finance and Construction Company will provide the ship channel, turning basin and pier in connection with the building of a causeway across Indian River.

Jetty Contract, Wilmington, N. C.—The contract for building a series of jetties along the Wrightsville Beach ocean front has been awarded to Jesse A. Howland of Sea Bright, N. J. The price for carrying out the work is \$27,721.50. There are to be five different jetties, the extreme ones being about one and one-half miles apart. One will jut out at a point north of the Oceanic hotel, one

south of Lumina and the three remaining will be placed at varying intervals along the beach. They will vary in length from 250 to 350 feet. The material will be wooden sheet-piling.

Wharf and Grain Elevator, Portland, Ore.—Oregon, Washington Railway and Navigation Company, Montgomery Ward Building, has had plans prepared for a 137 by 360 foot wharf at Albina Dock, covered shed 24 feet high, 180 feet double track trestle, 80 by 120 foot open wharf, wheat elevator, 104 feet high, capacity 310,000 bushels, and 119 by 350 foot warehouse. \$220,000. S. Murray, Montgomery Ward Building, assistant chief engineer.

NEW INCORPORATIONS

The Pacific-Caribbean-Gulf Line, capital \$1,000,000, chartered under Delaware laws.

The Callaghan Transportation Corporation, capital \$100,000, chartered under Delaware laws.

Western Transit Corporation, capital \$100,000, chartered in Delaware, to build and operate boats.

The Nautilus Steamship Corporation of Manhattan has increased its capitalization from \$800,000 to \$900,000.

The Pacific-Caribbean-Gulf Line, capital \$1,000,000, chartered under Delaware laws. Incorporators: Steele Steamship Line.

The General Marine Salvage Corporation, capital \$750,000, chartered under Delaware laws. Corporation Trust Company of America, registrars.

The General Marine Salvage Corporation, capital \$750,000, incorporated under Delaware laws. Incorporation Trust Company of America, registrars.

California-New York Steamship Company, capital \$12,500,000, incorporated in Delaware. Delaware Incorporating Company, registrars, Wilmington.

The C. & G. Salvage Corporation, of Manhattan, capital \$100,000, chartered at Albany. Incorporators: B. & J. P. Greenstone and A. M. Garbade.

The Bison Steamship Corporation, of Tonawanda, N. Y., capital \$150,000, chartered at Albany. Incorporators: J. J. and M. O'Hagan and J. Gehm.

The Morecraft Transportation Corporation, of Wilmington, Del., capital \$500,000, incorporated under Delaware laws, to engage in the operation of boats.

Intercoastal Shipping Service, of Manhattan, capital \$20,000, chartered under New York laws. Incorporators: G. V. Reilly, S. C. Wood and H. C. Hand.

The International Trade Developer Corporation, to foster world trade, capital \$1,000,000, incorporated in Delaware. Incorporators: Z. G. Dunn, C. H. Stanley and A. J. Brook, of Chicago.

The New York, Atlantic City and Philadelphia Steamship Company, capital \$2,000,000, incorporated in New York. The beginning of this line will give Philadelphia two services to New York.

The Diesel Steamship Company, capital \$25,500,000, chartered under Delaware laws. Incorporators: Edward Whitton, of Chatham, N. J.; Edwin A. Quick, of Brooklyn, and P. Tyson, of New York.

The Mexican, American Fruit & Steamship Corporation, capital \$12,000,000, organized under Delaware laws. Incorporators: F. J. Porter, Montgomery B. Angell and Otis T. Bradley, of New York.

The Pacific Mail Corporation, capital \$1,000,000, incorporated under Delaware laws. Incorporators: F. M. Stokes, of Woodhaven, L. I.; Joseph F. Mann, of Bloomfield, N. J., and William D. Ahearn, of Brooklyn.

Philadelphia Derrick & Salvage Corporation, capital \$500,000, incorporated in Delaware. Incorporators: Clinton E. Rowe, of Whitestone, New York; Charles P. Kramer, of Far Rockaway, N. Y., and Joseph Lilly, of Brooklyn.

United American Terminals, to do wharfage and freighting, capital \$100,000, chartered under Delaware laws. Incorporators: Eugene C. Tobey, of New York; Allen W. Lishawa, of East Orange, and William T. Dunn, of Long Island City.

The Knowl Trading Company, capital \$100,000, incorporated under Delaware laws, to do business as shipbrokers. Incorporators: George S. Brengle, of Arlington, N. J.; Hurlburt McAndrews, of Mam-

aroneck, N. Y., and P. J. R. McIntercept, of New York.

The McCormick Steamship Company of San Francisco, capital \$500,000, has been reorganized with the following officers: Charles R. McCormick, president; Sydney M. Hauptman, vice-president; Charles L. Heutter, second vice-president and general manager, and J. S. Brown, secretary and treasurer. John M. Hencken has been appointed operating manager of the company, and J. C. Strittmatter, freight manager. The Munson-McCormick Line operate a joint inter-coastal service.

GOVERNMENT WORK

Dredging, Galveston, Tex.—U. S. Engineer Office, Galveston, received bids July 20 for dredging the Houston Ship Channel.

Dredging, Galveston, Tex.—Bids were received July 21, at the office of the United States Engineer, Galveston, for dredging in Texas City Channel.

Bids Rejected, Milwaukee, Wis.—U. S. Engineer, Federal Building, Milwaukee, rejected bids for dredging approximately 450,000 cubic yards at Green Bay, Wis.

Dike, St. Louis, Mo.—United States War Department, Federal Building, Kansas City, plans concrete and rubble dike at mouth of Missouri River, near St. Louis.

Dredging, New Jersey.—U. S. Engineer Office, Wilmington, Del., received sealed proposals, July 9, for dredging Maurice and Cohamsey Rivers, N. J. Further information on application.

Six Dump Scows, Louisville, Ky.—Sealed proposals were received by U. S. Engineer Office, July 16, for furnishing and delivering six steel dump scows. Further information on application.

Dredging, New Orleans, La.—Sealed proposals were received by the U. S. Engineer Office, New Orleans, July 19, for dredging in the Calcasieu-Sabine section of the Intracoastal Waterway.

Dredging, Detroit, Mich.—U. S. Engineer, 337 Federal Building, Detroit, plans dredging Saginaw River to restore 18.5 feet of channel in Saginaw Bay and 16.5 feet channel in Saginaw River.

Steel Derrick Boat, St. Paul, Minn.—Sealed proposals were received by United States Engineer Office, July 31, for constructing and delivering a steel derrick boat. Further information on application.

Dredging, Providence, R. I.—U. S. Engineer, Providence, awarded the contract for dredging in Duck Island Harbor, Conn., to Columbia Dredging Company, 30 Church street, New York City. \$36,800.

Excavation, Wilmington, Del.—U. S. Engineer, Wilmington, Del., will receive sealed proposals until August 2 for excavating the inland waterway from Delaware River to Chesapeake Bay, Delaware and Maryland.

Reboiling Tug, Florence, Ala.—The United States Engineer Office of the War Department, Florence, Ala., is reboiling the tug General John Coffee. Foster radiant heat type superheaters are to be installed.

Fourteen Steel Barges, Memphis, Tenn.—The Mississippi River Commission, First and Second Districts, Room 1006, McCall Building, Memphis, received sealed proposals July 18 for furnishing fourteen steel barges.

Dike, New York, N. Y.—U. S. Engineer, 616 Army Building, awarded the contract for a 3,400-foot timber dike north of Shooters Island, New York and New Jersey, to Rhodes & Manvel, Inc., 90 West street. \$75,785.

Contract Awarded, Nashville, Tenn.—U. S. Engineer, Custom House, awarded the contract for 365,000 feet of yellow pine timber for Lock and Dam 8, Cumberland River, to Great Southern Lumber Company, Bogalusa, La. \$18,000.

Stone for Rubble Mound, Alpena Harbor, Mich.—Sealed proposals were received by the United States Engineer Office, Detroit, Mich., July 30, for furnishing and placing stone for rubble mound at Alpena Harbor, Mich. Further information on application.

Breakwater, Alpena, Mich.—Bids will be received by U. S. Engineer Office, 337 Federal Building,

Detroit, until July 30 for 11,700 tons of core and 10,300 tons of Armor stone, etc., for a rubble mound breakwater, 1,030 feet long at the southerly side of the river mouth.

Derrick Boat, Memphis, Tenn.—Sealed proposals were received at the office of the Mississippi River Commission, First and Second Districts, Room 1006, McCall Building, Memphis, Tenn., July 19, for furnishing one 25-ton steel derrick boat, complete. Further information on application.

Contracts Awarded, Los Angeles, Cal.—The United States Engineer Office, Los Angeles, awarded the contract for the dredging of the main channel of Los Angeles Harbor to widen it from 500 to 1,000 feet, to the San Francisco Dredging Company and the Fred C. Frank Construction Company.

Stone Riprap, Keweenaw Waterway, Mich.—Sealed proposals were received by the U. S. Engineer Office, Duluth, Minn., July 3, for removing timber superstructure and furnishing and placing stone riprap along and on the west breakwater, Upper Entrance of the above waterway. Further information on application.

Bids Rejected, Buffalo, N. Y.—The U. S. Engineer Office, Federal Building, Buffalo, opened bids on the twentieth for dredging and rock excavations in the Black Rock Canal, Buffalo. All bids were deemed too high, and part of the work, consisting of the triangular area, will be re-advertised, probably about September 1.

Runners, Wilmington, Del.—Sealed proposals, in duplicate, will be received at the U. S. Engineer Office, Wilmington, N. C., for two runners, port and starboard, for 15-inch pumps in dredge Comstock, the runners to be cast steel, machined, bored, keyseated, fitted with inboard and outboard liners, ready to install, delivered f. o. b. cars, Wilmington, N. C.

Harbor Improvement, Philadelphia, Pa.—The contract for dredging in Delaware River, Philadelphia Harbor, 201,000 cubic yards excavation, minimum allowable over depth 84,000 cubic yards, has been awarded to the American Dredging Company, Mariner and Merchant Building, Philadelphia, by the United States Engineer Office, 815 Witherspoon Building. Price \$68,340.

Sale of Used Equipment, Panama Canal.—Sealed proposals for the purchase of railroad, marine construction, mechanical, electrical, and miscellaneous equipment, will be received at the office of the General Purchasing Officer, The Panama Canal, Washington, D. C., until 10:30 o'clock a. m., August 2, 1923, at which time they will be opened in public for purchasing the above-mentioned equipment. Blanks and information relative to this circular (1525) may be obtained from this office. A. L. Flint, General Purchasing Officer.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson,
U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York
President—E. A. Simmons.
Secretary—K. W. Heinrich.

The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irrving G. Keller.

Port of New York Authority

11 Broadway, New York
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter.

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morrison,
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

September, 1923

No. 9

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY
30 Church Street, New York

F. B. WEBSTER, Editor
H. H. BROWN, Managing Editor

L. S. BLODGETT, Associate Editor **W. Z. GARDNER**, News Editor

Contributing Editors

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MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

Requests for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult, and often impossible, to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address, please be sure to send us your old address as well as the new one.

A Great Loss

THE people of these United States have suffered a great loss in the untimely death of President Harding. All classes of men and women in every industry have felt and expressed this loss with genuine sorrow but none more than those who build and operate ships.

Our President was the greatest friend of the merchant marine. It was his dearest wish that American shipping should be developed and firmly established during his administration on a basis adequate to serve our commercial and naval needs. If he had received the support in Congress that he should have had from his own party, his ambition would now be well on its way to fulfilment.

There is nothing that we can do that would please our departed leader more or do him greater honor than to carry out his wishes in this respect. He never wavered in his determination to secure such legislation as would encourage private interests to embark on shipping ventures. Let us, therefore, "gird up our loins" and fight with renewed vigor so that President Harding's name may be perpetuated as the father of the American merchant marine.

An Imperative Demand

THE Chamber of Commerce of the United States, commercial, manufacturing and business organizations and every man in the street who believes in the principles upon which this country has become great demand that Government operation whether it be of ships, railroads, mines or bureaucracy in general should and ought to be avoided except as a last extremity in great emergencies.

The Shipping Board has alarmed the entire business world with its plan of direct operation. At this writing the board itself has split on the exact method it proposes to adopt. Four of the commissioners favor the creation of eighteen subsidiary companies of the Emergency Fleet Corporation and three commissioners favor centralized direct operation of the entire fleet.

Referring to the plan for eighteen subsidiary corporations, we have already pointed out in a recent editorial that such a method could only result in multiplying the losses that the Government is now sustaining. Again, even if the efficient heads of the present operating companies could be induced to accept the positions of presidents of these corporations, everyone familiar with political procedure would know that their resignations would have to be handed in upon acceptance of their jobs. Then just as soon as they got their particular corporation going at all straight some politician would have a friend who he thought ought to have their job and out they would go.

As to the direct operation of the fleet as a whole, the only comment that we wish to make is that we do not believe that the most efficient business organization in existence could take over such a stupendous proposition and make a success of it.

The Shipping Board was created to devise ways and means of rendering Government assistance to the merchant marine. Why is it worrying and spending its entire time over a form of contract which at least is creating experienced shipping executives? Everyone knows that some form of Government aid is necessary in order to interest private capital in shipping. Why are they not devoting their time to this, the major factor, and to the revision and codification of our navigation laws?

We cannot believe that President Coolidge will sanction Government operation in view of the obvious opposition of all commercial interests and also with the knowledge that such a policy has been condemned more than once by the late President Harding. It is gratifying that the board postponed action until the shipowners and operators presented

their case on August 28 and we trust that, if it is not convinced of the danger of its proposed course by this conference, it will at least delay action until the representatives of all classes of industry from the entire country voice their sentiments at the American Marine Congress to be held in New York during the week of November 5-10.

The Philippine Mandate

SECTION 21 of the Merchant Marine Act of 1920 relating to the extension of our coastwise laws to include the Philippine Islands still remains inoperative. Not only has Congress directed in this section that after February 1, 1922, the coastwise laws shall extend to the Philippines and all other possessions of the United States not then covered thereby, but it has also directed that the Shipping Board before the expiration of that year should see to it that adequate steamship services at reasonable rates were established.

There can be no loophole for the evasion of the enforcement of Section 21 except that of the lack of shipping facilities to handle the passenger and freight business between the Philippines and the United States. And, in this connection, even if there were any doubt about the language of Section 21, the board has only to turn to Section 7. This section also specifically directs that the board "investigate and determine as promptly as possible after the enactment of this Act what steamship lines should be established and put in operation from ports in the United States, any Territory, District or possession to such world and domestic markets as in its judgment are desirable for promotion, development, and expansion of the foreign and coastwise trade of the United States."

It is known that President Harding on several occasions had considered putting this section into effect. Has the board with all its surplus tonnage neglected to provide adequate shipping facilities and, if so, why? Mr. Vincente Villamin, Philippine expert, recently stated that there were 1,272,780 tons of shipping engaged in the Philippine trade, of which 448,971 tons were British and 405,273 tons American. Is this trade carried in foreign vessels not desirable for American ships or is there some reason more potent than the laws on our statute books that prevents the proper development of our merchant marine?

We believe that we have not far to look for such a reason. Is it not the influence of shippers and exporters both in this country and the Philippines who may fear that the confinement of this trade to American vessels would increase the freight rates? That such would not be the case may be seen from a comparison of the rates charged including both east and west bound voyages between New York and San Francisco. The distance between these ports is approximately the same as the distance from San Francisco to Manila.

From figures obtained from Mr. R. T. Merrill, director of the Bureau of Research of the Shipping Board, the average freight rates for five months on the vessels of the Nawsco line between New York and San Francisco were \$8.37 as compared with an average freight rate of \$7.17 to the Orient. Thus it will be seen that there is very little difference between American vessels and the vessels of other nations. It

should be added that Panama Canal tolls were deducted from the coastwise figures to make the comparison fair.

No one can doubt the wisdom of the coastwise laws as they are now applied. They have caused a phenomenal growth in American shipping plying between our Atlantic and Pacific seaports. The same would be true in regard to the Philippines and, still further, it would be of great advantage to our commercial development and to the creation of an adequate auxiliary Naval Reserve.

Awakening Public Interest in American Shipping

IN an article widely published throughout the United States through the Hearst Newspaper Feature Syndicate and the subject of extensive editorial comment Colonel E. A. Simmons, president of the American Marine Association, states that the passenger business being given American flag ships is such as to fill to capacity the greater number of those in service and that a much heavier percentage of travelers use American steamers than foreign steamers, as gaged by the carrying capacities of the respective lines engaged in trade.

"My investigation shows that the favor of travel has been turned to American ships," says Colonel Simmons, "solely because of the service that is being given and not for any patriotic reason. . . . Eventually, I believe that the support which is now being so generously given our passenger ships will bring about on the part of American people a desire that our freight or cargo ships be given such patronage as will make them the talk of the seas, as our passenger ships have already become."

It is the bringing of such first hand information directly to the majority of the American people that will arouse public support of our ships and stimulate patronage not only for American passenger vessels but also for American cargo ships. As pointed out by James A. Farrell, president of the United States Steel Corporation, in speaking before the National Trade Council at New Orleans: "The greatest subsidy our ships could have in the overseas trade would be the support of the American people."

The Marine Exposition

THE annual Marine Exposition, which will be held during the week of November 5-10 at the Grand Central Palace, New York city, will have a decided influence on the delegates from the commercial, manufacturing and farming organizations who will attend the American Marine Congress that will occur during the same week.

It is very gratifying and encouraging to note the interest that the large number of organizations from the interior of the country are taking in this Congress. Sixty-eight organizations, listed on page 522 of this issue, have already appointed representatives. The truth of the matter is that the people of the interior are awakening to the fact that we must have an adequate merchant marine.

The marine field, therefore, is under a decided obligation to give these delegates every bit of marine information that is possible and there is no better way to do this than to make this year's exposition the largest and best ever given.

James Swan, Noted Naval Architect, to Join Editorial Staff of Marine Engineering and Shipping Age

Former Shipyard Executive, Well Known in This Country and Abroad, Resigns Shipping Board Post to Take Up Editorial Work This Month

JAMES SWAN, naval architect of the ship sales' division of the United States Shipping Board, has resigned to join the editorial staff of MARINE ENGINEERING AND SHIPPING AGE. In taking up his editorial work this month Mr. Swan brings to the magazine an intimate knowledge of the problems confronting the Shipping Board, gained by one and one half years in charge of a comprehensive survey and valuation of its fleet, together with a wealth of experience gained in the shipbuilding field both as a ship designer and as a shipyard executive.

As a preliminary to entering upon his editorial duties, Mr. Swan sailed for England on the *George Washington*, September 1, to attend the British Shipping Exposition and a meeting of the Institution of Naval Architects.

AN M. I. T. GRADUATE

Mr. Swan is a native of Boston, Mass. His parents were of English descent, his father's family having come from Newcastle, England, in 1635 and settled in what is now Cambridge, Mass. He was educated in the Boston public schools and the Massachusetts Institute of Technology, graduating from that institution in 1891 with the degree of Bachelor of Science in the Department of Mechanical Engineering.

Having become much interested in marine engineering which, at that time, was taught in a limited way at the Institute as a branch of the course in mechanical engineering, Mr. Swan, after his graduation, determined to go abroad for further study along this line, if it could be managed. His classmate, Charles P. Wetherbee (now vice-president and superintendent engineer of the Bath Iron Works), had already entered the French Government School of Naval Architecture at Paris and other friends had gone to Glasgow or Greenwich. The enthusiasm of Homer Ferguson (now president of the Newport News Shipbuilding & Dry Dock Company), who had just returned from Glasgow, made the latter school with its neighboring shipyards on the Clyde appear most attractive and desirable, so Mr. Swan applied himself to the task of raising the necessary funds for this purpose by teaching at the Institute and working during the summer months in the shipyards.

STUDIES NAVAL ARCHITECTURE ABROAD

In 1896, Mr. Swan entered the School of Naval Architecture at Glasgow University, studying under Professor (now

Sir John) Biles. The latter's assistant at the time was Herbert Sadler, now professor of naval architecture at the University of Michigan. Among Swan's classmates were Assistant Naval Constructors Evans, Adams, Robinson and Groesbeck of the United States Navy and Commander (later Rear-Admiral) Fuji of the Japanese Navy. At this time, the late S. F. P. Thearle was one of Lloyd's surveyors at Glasgow and Mr. Swan was fortunate enough to meet Mr. Thearle and to accompany him regularly in his shipyard visits with the result that a warm friendship grew up between the two, terminating only with the latter's death.

After completing the Glasgow courses and receiving the certificate awarded to those successfully passing the final examinations, several months were spent in Professor Biles' office at Southampton, England, working on plans and calculations for various vessels and other similar work undertaken by Professor Biles in his large consulting practice.

EMPLOYED BY LEADING AMERICAN SHIPYARDS

After returning to the United States, Mr. Swan entered the office of Naval Constructor J. J. Woodward, U. S. N., at Newport News, Va., remaining in government employ for the period of the Spanish war. In the fall of 1898 he was employed by the Newport News Shipbuilding & Dry Dock Company as a draftsman and computer. He remained with this company for two years

during which time the Pacific Mail Steamers *Korea* and *Siberia*, the largest ships which up to that time had been laid down on this side of the Atlantic, were designed and the battleship *Missouri*, originally intended for a 16-knot ship, was redesigned for a speed of 18 knots and an increased displacement, practically a new design. With all of this interesting work Mr. Swan was closely associated, the experience gained in Professor Biles' office being of great value, particularly in connection with the Pacific Mail ships.

In March, 1900, Mr. Swan entered the employ of the New York Shipbuilding Company, then just commencing operations at Camden, N. J. He remained in the employ of the company for 17 years, the last five as assistant to the president. From 1909 to 1914 he was largely occupied with foreign work for the company, traveling in Great Britain, Turkey, China, Japan, Russia and South America.

In 1917 the Herreshoff Manufacturing Company of Bristol, R. I., the celebrated yacht building firm, was taken



James Swan

© Harris & Ewing

over by new owners and Mr. Swan was called to the position of general manager of the reorganized company. Here he remained for several years during which time a large and varied amount of war work was carried out. One relatively small item of this work, which nevertheless became famous, was the building of the hull of the flying boat *N-C-4*. In the year immediately following the war a number of fine yachts were constructed at Bristol, but the cost of this class of vessel had become practically prohibitive and the yacht-building business soon was reduced to the construction of launches and small sailing craft.

BECOMES PRESIDENT OF GROTON IRON WORKS

In 1920 Mr. Swan was offered the position of president of the Groton Iron Works at Groton, Conn., and in view of the dullness of the yacht-building business, as well as a strong personal inclination to larger work, he accepted this position. The owners of the Groton plant had rather ambitious plans for its development, but the expected work did not materialize, and, after a year spent in the construction of a steel propeller ferryboat for the city of Boston and some miscellaneous small work, the plant was permanently closed.

GOVERNMENT WORK

Early in 1921, the Ship Sales' Department of the Emergency Fleet Corporation undertook a comprehensive valuation of its fleet and Mr. Swan was called to Washington to carry out this work. It was a task of considerable magnitude and included a detail survey of all the laid-up Shipping Board vessels, about 900 in number. For the survey, a large staff was employed, the actual physical survey occupying about three months' time. The results of all this work are now being tabulated and the final report of survey and valuation is nearing completion.

United American Lines Inaugurate New Coast Service

THE Intercoastal freight and passenger service recently announced by the United American Lines, will be opened by the steamship *Sudbury*, which will sail from Baltimore on September 8 and from New York, September 13. Fourteen modern vessels will operate in a weekly service between Baltimore and New York, Los Angeles Harbor, San Francisco, Portland, Seattle and Tacoma.

The *Mount Clinton* and *Mount Carroll*, formerly in the transatlantic trade, which are now being converted into cargo carriers with cabin accommodations for a few passengers, will be included in the fleet. All the vessels to be used in this service will be over 10,000 tons deadweight, thus making the fleet one of the largest in the intercoastal trade.

The United American Lines have taken over the branch offices in Pittsburgh and Buffalo, formerly maintained by Houlder, Weir & Boyd. Beginning August 27, C. H. Sprague & Son have been acting as agents for the line at Boston and Trosdal, Plant & LaFonta will act as agents at Philadelphia. Branch offices of the line are also located at Baltimore and Chicago. The Pacific coast headquarters will be located in San Francisco, Cal.

CROOK SHIPYARD SOLD.—The municipality of Baltimore is buying the extensive shipyard properties of the Crook Shipbuilding Company, that city, for \$440,000. The property includes a frontage of 462 feet on the harbor and extending back 1,600 feet, a 600 by 80 foot pier with a 565 by 60 foot building thereon, a 320 by 115 foot warehouse of 350,000 square feet floor space, 2,500 feet of railroad sidings, two-story office building, etc. The city will make use of the Crook properties in connection with an expenditure of many millions of dollars for harbor improvements.

Yachts as Naval Auxiliaries

By Norman L. Skene

ONE lesson that should have been learned by this country from the recent war is the usefulness of yachts and yachtsmen in time of war. More than 650 yachts and motorboats were taken over by the Navy and performed highly useful service of various sorts such as gunboats, hospital ships, dispatch boats, coastal patrol, training ships and station boats. It was as training ships probably that the converted yachts were most useful. Knocking around at sea for a few weeks in a small vessel teaches more real seamanship to the raw recruit than months of drill on land or on large vessels.

Yachts of all kinds were taken, even sailing yachts. A few yachts were bought outright but most of them were practically given or loaned to the Government by patriotic owners. Such yachts as were not destroyed or retained by the Navy were returned to their owners very much the worse for their war service.

YACHTSMEN MAKE GOOD NAVAL OFFICERS

A secondary advantage of a large yachting fleet is the potential military value of its personnel. Experienced yachtsmen are the best of material for expanding the personnel of the Navy in time of war and in the World War a great many American yachtsmen demonstrated this conclusively, filling positions of importance in all branches of the Naval service. A yachtsman invariably acquires an intimate knowledge of the handling of boats under various conditions that is the basis of real seamanship.

With the fact of the usefulness of yachts and yachtsmen to the Navy in time of war so recently and conclusively demonstrated, it would seem wisdom on the part of our Government to offer every encouragement to the development of yachting. The present policy of heavily taxing yachts is certainly no encouragement and should be abandoned. The sales tax of ten percent in addition to a substantial annual user's tax added to the excessive cost of building and operation under present conditions are very real deterrents to new construction. Yacht building is at a very low ebb due to above conditions and needs every encouragement. The British Government recognizes the importance of yachts as naval auxiliaries and places no tax on them.

NAVY REQUIREMENTS TOO DRASTIC

It is true that yachts "built according to plans and specifications approved by the Navy Department" may be exempt from taxation but this provision offers no real relief for the requirements are so drastic that few if any yachts will be built in compliance with them. The following are a few of the requirements:

- Length between perpendiculars to be not less than 200 feet.
- To be constructed with watertight subdivisions equivalent to naval practice.
- To have 2,500 miles steaming radius.
- To be capable of carrying an armament of four or more guns of at least 3-inch calibre and four AA machine guns with magazines to carry the standard ammunition allowance.

SUITABLE VESSELS SHOULD BE SUBSIDIZED

It would be good policy not only to exempt yachts fulfilling requirements such as these but to subsidize them as an incentive to build such vessels. The requirements should be ameliorated to include vessels of the size and type of the 110-foot sub-chasers of which so many were built during the war, or even smaller, as one of the lessons learned from the recent war was the value of small fast motorboats even as small as forty-foot length for certain naval uses. The adoption of a policy of encouragement of yachting on the part of our Government involving the abolition of taxes and the subsidizing of certain types would be a very wise move.

Shipping Board Policy Still Unsettled

Division in Shipping Board and Appointment of Advisory Committee by President Prevents Precipitate Action

By Harold F. Lane*

DEVELOPMENTS since the death of President Harding have made it increasingly evident that no precipitate action is likely to be taken to change the present policy of the Shipping Board as to the manner of operating its fleet and with each day of delay the danger that a policy of direct Government operation will be adopted appears to grow less. President Coolidge is yet to be convinced as to either the advisability and practicability or the legality of the proposed plan of operation of the Shipping Board vessels by a group of Government financed subsidiary corporations. As to the legality of the plan, he expects to ask an opinion of the Attorney-General and as to the merits of the plan in general he is thinking of seeking advice from outside of the board by the appointment of a special committee consisting of the Chairman of the Shipping Board, the Secretary of Commerce, the Secretary of the Treasury, the chairmen of the Senate and House committees having merchant marine affairs in charge and possibly one or two others, to study the question.

This was officially announced at the White House on August 21, following several conferences between President Coolidge and Chairman Farley and other members of the board. The President does not, however, consider the plan of operation through subsidiary corporations, of which the stock would be owned by the Government, amounts to "direct" Government operation in any technical sense and is represented as referring to it rather as "indirect" Government operation, but he has also made it plain that no change in the present plan is likely to be adopted without careful consideration, although he is hopeful that some plan can be devised to reduce the present losses.

SUBSIDIARY CORPORATIONS, LASKER'S PLAN

The subsidiary plan has heretofore been generally referred to as providing for "direct" Government operation by former-Chairman Lasker, President Harding and Chairman Farley. It has also come to be referred to frequently as the Lasker plan because in his letter of resignation to President Harding, Mr. Lasker said that, with the failure of the subsidiary plan, and if the ships could not be sold by the board on favorable terms, the only apparent alternative is to "go the full length of direct Government operation" and he recommended the creation by the Emergency Fleet Corporation of 12 to 18 subsidiary corporations. President Harding had also expressed general approval of this idea in a speech in which he said that direct Government operation would be "aggressively pursued," if that turned out finally to be the only alternative.

Some significance in this connection has been attached to the announcement by President Coolidge that he intended to carry out the policies of his predecessor in office, but he has also indicated that this statement applied "in general" and that the policies might necessarily be subject to such changes as President Harding himself would have made if he had lived. Moreover, so far as known, President Harding had never specifically approved any definite plan of Government operation and it is well known that he frequently condemned the principle of Government operation, viewing it only as a final alternative. As no definite feasible substitute for the present system of operation was laid before

him, it can hardly be said that President Coolidge is in any way committed.

Moreover, there is a sharp division in the Shipping Board itself as to the plan which should be adopted. Sanction to the plan of subsidiary corporations was given by a bare majority when a vote was taken about August 1, it is learned, Chairman Farley and Commissioners O'Connor, Thompson and Lissner voting in approval, while Commissioners Benson, Plummer and Haney recorded their opposition. No official announcement has ever been made of this fact nor have the details of the plan been made public.

Chairman Farley of the Shipping Board on August 16 submitted to the President a detailed written report covering the views of the board as to what ought to be done and it was later stated at the White House that several statements on the subject were before the President and would have careful consideration before a decision was reached as to what, if any, changes should be made. Chairman Farley also had another conference on the day before the announcement of the proposed appointment of a committee. Commissioner Plummer, who is one of those opposed to the plan, has also presented his views to the President. Chairman Farley had also stated that the Government would not put a new shipping plan into effect until after representatives of the shipowners' and ship operators' organizations had had an opportunity to present alternative plans. It is understood that the details of the plan voted on were prepared by the special committee, composed of Chairman Farley and Commissioners O'Connor and Thompson, appointed on June 4, and were based on the recommendations of Mr. Lasker in his letter of resignation.

DIRECT OPERATION, ALTERNATE PLAN

Commissioners Plummer and Benson are reported to favor methods of direct operation which will give the present operators an opportunity to secure freight for the board's vessels on a commission basis, but which would leave them no part in the handling of the boats. Commissioner Haney is said to regard direct operation of any character as permissible only as a last resort. It is also understood that while Commissioner Lissner is in favor of the subsidiary plan for those operations conducted by the Government, he still is in favor of making every effort to sell as many of the lines as possible for private operation. The claim made for the subsidiary plan is that it would be much easier to sell a line as a going concern with its good-will, organization and terminal facilities, by the transfer of a certificate of stock than to sell simply a certain number of ships for operation on a line where the good-will and going concern features are under the control of the managing operators.

The position of the minority was that the proposed transfer of the ships to subsidiary corporations would involve a delegation of the trusteeship of the Emergency Fleet Corporation which would be illegal, and also that the plan would be impracticable. They insisted at least on an opinion from the Attorney-General as to the legality of the plan, although the legal department of the Shipping Board is said to be of the opinion that it is legal.

OWNERS AND OPERATORS CONFER WITH BOARD

Representatives of the shipowners and operators were given an opportunity to present alternative plans at a conference

*Our Washington correspondent.

with members of the Shipping Board at Washington on August 28. This conference was originally set for August 21 but was postponed at the request of the shipping men. One plan proposed by the American Steamship Operators' Association was formally rejected by the Shipping Board after a long session on July 24. Chairman Farley issued a statement saying that the plan proposed that the board deliver to the operating companies the needed vessels to maintain service on the present established routes for the absolute control of the operating company without board supervision, the board to pay the expenses and any losses and the profits to be set aside in a special fund for the use of the operators to buy ships from the board. This, he said, "has all of the inherent defects of the present M. O. 4 contract which is to be abandoned, and adds a number of other objections." He added that the board hoped to be able shortly to make a definite statement of the plan for direct operation on which it was working.

Later the operators' association made public a formal statement protesting against direct Government operation of ships and saying that such a policy would bring about complete failure of the efforts authorized by Congress to develop a privately owned merchant marine. Further correspondence brought forth letters from Mr. Farley to the Steamship Owners' Association and the Ship Operators' Association stating that while the board had fully considered their proposals it would be glad to discuss the situation further with them at any time and the arrangement for the new conference resulted. In these letters Mr. Farley referred to two of the objections to the proposed plans as follows: "Your plan provides no supervision and control of the expenditure of Congressional appropriations, and in addition contemplates the establishment of a sinking fund to be carried over a minimum of three and a maximum of six years. Manifestly, both or either of the above provisions are impossible of execution under the present law."

U. S. CHAMBER OF COMMERCE OPPOSED TO GOVERNMENT OPERATION

A committee of officers of the United States Chamber of Commerce called on the President on August 20 to put before him the position of American business on important economic questions and on the subject of the merchant marine told him that the chamber is opposed to the Government engaging in commercial business. It believes that further efforts should be made to evolve a plan of operation by private citizens before entering upon Government operation. The chamber favors the ship subsidy in the effort to equalize operation disadvantages of American ships and it has asked an investigation of the possibility of relaxing the burdensome restrictions.

American Marine Congress Grows Bigger and Bigger

NO better indication of the interest that is being taken in the all-American Marine Congress which will be held in New York during the week of November 5-10 could be desired than the long list of representative organizations who will cooperate, printed below. That which is needed above everything else is a definite expression of facts and findings that will represent the non-partisan opinion of all sections of the country on what ought to be done to establish our merchant marine.

ORGANIZATIONS COOPERATING TOGETHER WITH NAME OF CONTACT REPRESENTATIVE

American Manufacturers' Export Association, Myron W. Robinson; Council of American Shipbuilders, Homer Ferguson; American Steamship Owners' Association, Winthrop L. Marvin; United States Ship Operators' Association, Charles H. Potter; New York Tow Boat Exchange, Fred B. Dalzell, Jr.; Neptune Association, Capt. John F. Milliken; National Board of Steam

Navigation, N. L. Cullen; Lake Carriers' Association, William Livingston; National Marine Engineers' Beneficial Association, William S. Brown; Ocean Association of Marine Engineers, T. A. King; New York Boat Owners' Association, William H. Kelley; Hudson River Improvement Association, Clarence R. Birkett; South Atlantic States Association, Matthew Hale; Atlantic Coast Shipbuilders' Association, Clarence S. King; Maritime Association of the Port of New York, John Dowd; American Marine Association (Officers and Executive Committee); Society of Naval Architects, Captain C. A. McAllister; Charleston Chamber of Commerce, Charleston, S. C.; American Society of Marine Designers, C. C. Jacobson; Propeller Club; American Association of Advertising Agencies, James O'Shaughnessy; The National Association of Cotton Manufacturers, Henry C. Meserve; American Bureau of Shipping, Capt. C. A. McAllister; United States Navy; City of Buffalo, N. Y., Mr. Frank X. Schwab; The Railway Car Manufacturers' Association, W. F. Goss; National Merchant Marine Association, Henry C. Wiltbank; American Society of Naval Engineers, Rear Admiral C. W. Dyson; United States Producers' Association; Chamber of Commerce of the United States; United States Shipping Board; The Commission of Public Docks, of Portland, Ore.; G. B. Hegardt; City of New Orleans, La., Mayor A. J. McShane; City of Detroit, Mich.; American Association of Engineers, Fred Lavis, A. Knowles, and I. C. C. Cooper; National Association of Credit Men, Edward P. Tuttle; American Engineering Standards Committee, A. W. Whitman; United States Department of Commerce; National Paint, Oil & Varnish Association, Harry J. Schnell; The American Legion, E. E. Spafford; Ohio Chamber of Commerce, George Carey; Detroit Board of Commerce, Charles E. Boyd; American Marine Standards Committee, Capt. R. D. Gatewood; City of Newark, N. J., P. H. W. Ross; American Institute of Mining and Metallurgical Engineers, Philip W. Henry; City of Portland, Oregon, Mr. George L. Baker; The Port of New York Authority, Eugenius H. Outbridge; Lorain Chamber of Commerce, Lorain, Ohio, G. W. Dudderar; Harbor Department City of San Diego, Cal., J. W. Brennan; National Safety Council; Madison Association of Commerce, Madison, Wis., Don E. Mow; Minneapolis Civic & Commerce Association, Herbert M. Gardner; Mid-West Farmers' & Manufacturers' Conference, Malcolm Stewart; Fidelity Marine Association of Masters and Mates, Capt. N. L. Proctor; American Fair Bureau Federation, O. E. Bradfute; Committee of Manufacturers on Standardization of Valves and Fittings; Passaic River Improvement Association; Edw. B. Lyman, Director; New York Freight Forwarders' and Brokers' Association; Savannah Board of Trade, Savannah, Ga., Devereaux Bacon; Cincinnati Chamber of Commerce, Cincinnati, O., Malcolm M. Stewart; City of Camden, N. J., Hon. Victor King, Mayor; International Association of Machinists, Alfred Peabody, Joseph L. Maxwell, Julius Meyers, George Rolph, John F. Dalton; City of Wilmington, Del., Hon. George W. K. West; Portland Steamship Operators' Association, Frank Ira White; City of Philadelphia, Pa.; Hon. J. Hampton Moore, Mayor; City of Trenton, N. J.; City of Chester, Pa.; City of Pittsburgh, Pa.

Standard Oil Tugboat Launched

SOCONY NO. 9, the second of two steel single screw tugboats building at the Tebo plant of the Todd Shipyard Corporation for the Standard Transportation Company, New York, was launched on August 6.

These tugs are to be equipped with vertical, compound surface condensing engines with cylinders 18½ and 40 inches diameter by 26 inches stroke, designed for a speed of 12 revolutions per minute, built at the Todd plant at 742 E. 12th Street, New York. The boilers will be three-furnace Scotch marine, 14 feet 9 inches inside diameter and 12 feet long, with a grate area of 75 square feet, a heating surface of 2,700 square feet and a working pressure of 160 pounds per square inch. Todd fuel oil burners will be installed.

The dimensions of the boats are: Length overall, 105 feet 9 inches; length between perpendiculars, 100 feet 5 inches; breadth molded, 24 feet; depth molded, 12 feet 9 inches; draft loaded for sea, 10 feet 6 inches, forward; 12 feet, in salt water.

New York Central Buys Weehawken Piers

THE Cunard Steamship Company has resold the 800-ton pier, K-44, south of the West Shore ferry terminal at Weehawken, N. J., to the New York Central Railroad Company, and also the old D. and H. coal dock, at the same Baldwin Avenue, half a mile south of the pier, to the same company. The latter will be remodeled and the railroad company will use both as freight piers. Former piers of the Cunard Line in connection with this development have been dropped.

"Homer" and "Joe"—Master Shipbuilders

A Résumé of the Accomplishments of Two Outstanding Leaders in the Shipbuilding Industry

By "Old Scotch"

NOW that those of us in the shipping business have, by force of circumstances, time to cogitate over the past, present and future it is well to glance back a few years and consider some of the remarkable feats performed in the great shipbuilding boom which we passed through as an incident of the Great War.

Important industrial accomplishments, such as the completion of this greatest shipbuilding feat of all time, cannot be carried on without developing or utilizing some outstanding men, as the personnel is bound to be reflected in the outcome of any human undertaking. Our shipbuilding facilities of pre-war years were "naturally" quite limited both as to physical equipment and personnel. Of this limited personnel all of them proved their mettle and became leaders among the thousands and thousands of men from all walks of life who rushed to the shipyards, in answer to the nation's call.

The leaders of the pre-war shipbuilders quite naturally became the super leaders of the greatly expanded industry, during and just following the fevered activities incident to so vast an undertaking, which involved the investment of the stupendous sum of over three and a half billions of dollars in yards and ships.

TWO OUTSTANDING LEADERS

Without disparagement to many other leading characters in this great work, we can all agree that two of the outstanding men in the great rush were Homer Ferguson of the Newport News Shipbuilding and Dry Dock Company and Joe Powell, the man in direct charge of the vast shipbuilding activities of the Bethlehem Shipbuilding Corporation.

Few there are among the large armies employed in the wartime shipyards, who did not know these two men either personally or by reputation; hence the title of this brief résumé of a "close-up" of these personalities.

Joe Powell, a born-and-bred New Yorker, and Homer Ferguson, a product of the old North State, have much in common, although representing the old civil war division of the country, the North and the South. Both were blessed with comely countenances, genial dispositions, the faculty for making friends to a marked degree, brilliant minds and unbounded energy. Both were educated under the tutelage of Uncle Sam at Annapolis, and both received that distinctive reward of scholarship, appointments to the Navy Construction Corps, which in common with the Engineer Corps of the Army brands the wearers of the insignia of their respective corps, as men of the highest scholarship and attainments.

AMERICAN MERCHANT MARINE, THEIR RELIGION

Both had the foresight, energy and opportunity to sever their connections with the Government, before advancing years and accumulated "fogies" had lulled their ambitions to a state of lethargy. Both absorbed the business acumen necessary for positions of great responsibility in a remarkably short space of time, and both with equal fervor made the advancement of everything that pertains to a strictly American merchant marine not only a hobby but a religion. When the time came for great accomplishments in their chosen profession they were on the job and not lacking a single attribute, physically or mentally, to make a success of the huge responsibilities which were to fall to their lots.

Through the lamented loss of President Hopkins on the

Lusitania, his mantle fell on the capable shoulders of Homer Ferguson, who had by that time worked his way up to the vice-presidency of the great Hampton Roads plant.

Joe Powell had gone from the position of assistant to the president of the William Cramp and Sons Ship and Engine Building Company to the presidency of the Fore River Ship and Engine Company, and, upon Mr. Schwab obtaining control of this concern and merging it with five other yards, he quite naturally placed the entire shipbuilding branch of the Bethlehem company under the direct charge of the hustling young executive, whose services he had obtained with the Fore River yard.

With such important positions of responsibility these two men began what was to be the most serious work of their lives—the fulfillment of the enormous demands for ships which were placed on these respective establishments. Equipped as both were, there was no chance of failure—success for their efforts was foreordained. From early in 1917 until the completion of the wonderful output of both naval and merchant vessels in 1920, it is doubtful if there were two busier men on earth than this same Homer and Joe. Back and forth to Washington, the seat of government, where their services and advice were almost constantly in demand, this busy pair were almost like shuttlecocks. Everywhere they went they radiated encouragement, spirit and "pep" to their assistants and to the officers of the Government who were demanding more than the capacity of the yards under their control.

Some one asked Joe Powell his permanent address during those troublous days, and his reply was the "Hotel Pullman," and indeed there were very few days that he was not contributing to that perambulating hostelry in his frequent trips between Bethlehem, Boston, New York, Wilmington, Baltimore, Washington, San Francisco and others places, attending to the various ramifications of the largest private shipbuilding organization the world has ever seen.

A CONVINCING SPEAKER

If any one could have guessed Homer Ferguson's whereabouts on any particular day in the future, he would have had to be gifted with second sight. If any week passed during the entire war when Homer was not wanted on some committee work in either Washington or New York, it has not been recorded. You see, Homer among his other attributes had obtained wide fame as a speaker. As one of his colored employees expressed it, "Mr. Homer certainly am the convincinest man"—a natural tribute to his skill in dealing with his workingmen, the majority of whom are and have always been descendants of Ham.

The story of how he "got that way" is quite interesting. Early in his shipbuilding career he had quite a local reputation as a speaker at launching banquets, church socials and other community gatherings. Some of his friends hearing of it, decided to try him out at the annual banquet of the American Society of Naval Engineers, an affair which, held at Washington, usually attracted some of the best post-prandial speakers from Congress and the Department. On the night of Ferguson's debut, and first appearance in the Big League, it so happened that the question of building battleships at Navy Yards in competition with the private yards was acutely in the public mind. Among the congres-

sional speakers was the Hon. John J. Fitzgerald of Brooklyn, who could not see much good in any naval appropriation, wherein his pet Navy Yard was not recognized. "Fitz," as he was known, was even then a very important member of the Appropriations Committee, and, as a general all-around debater and parliamentarian had few equals on the floor of the House. "Fitz" and "Fergy" locked horns at the drop of the hat, and the banqueters were treated to a debate which has long been remembered. The recruit from the Newport News Bush League of Oratory did not come off second best by any means, as Fitzgerald closed his remarks by saying, "If Mr. Ferguson builds ships as well as he argues, I have no fear for the future of our Navy."

Subsequently, Ferguson made his initial address at the banquet of the American Society of Naval Architects at the Waldorf in New York. A certain cabinet officer opined that all that American shipyards needed, was to build standardized ships, to meet overwhelming success. This aroused Ferguson's ire, and the way that he bowled over the cabinet officer's arguments has become a classic in the Society. Since these two events Homer has obtained a nation-wide reputation as a public speaker, a reputation which eventuated to a large extent, in his being elected president of the United States Chamber of Commerce.

AN ABLE CONGRESSIONAL WITNESS

A thorough knowledge of his subject, and a most convincing manner of presentation makes Homer Ferguson one of the ablest witnesses who ever appears before a Congressional Committee. During the early stages of the war, when everything seemed to be going to the bow-bows abroad, and nothing seemed to be able to start at home, Ferguson appeared before a Senate Committee to get money enough to start a housing proposition, necessitated by the vast increase of war workers in Newport News. Delays and visiting around the departments had nearly driven him to distraction. Hence when he appeared before the solons on the Hill, he was in a fine state of mind to state the needs of the hour. When Homer is deadly in earnest his eyes have a faculty of weeping to emphasize his seriousness. On this particular occasion several of the older senators became so impressed with his statements that they too wept with the witness. The chairman was so overcome with emotion that he did something never before heard of in the annals of legislation. At the climax of Ferguson's appeal the presiding officer said very solemnly: "Mr. Ferguson, if you can stay in Washington for 24 hours, I'll appoint a sub-committee to go with you to the housing officials and see that you get the money to start this proposition at once."

Ferguson stayed, and the money was made available in four hours.

Joe Powell accomplished great things during the war; although he does not possess the eloquence of Homer, his business rival, he has other ways of putting things across. Added to his winning personality there is a persistency of purpose in Powell's make-up that usually lands the bacon. This is best illustrated by an incident in his career which occurred after he had withdrawn from his shipbuilding activities. Let it be said here that our much-beloved and lamented President Harding knew both Homer and Joe and knew them well. Either one of them could have been Chairman of the Shipping Board if they would have accepted that position from the President.

Finally President Harding in his very persuasive manner, succeeded in getting Joe Powell to serve as president of the Emergency Fleet Corporation for a brief time. He consented to do this without pay, but, as the law prevents any one from serving the Government for nothing, he had to take \$1 per month. His first month's pay check was mounted in a frame and used as a paper-weight. As it cost him \$3 to have this \$1 check mounted, Joe allowed it was rather an uneconomical proposition.

THE LEVIATHAN

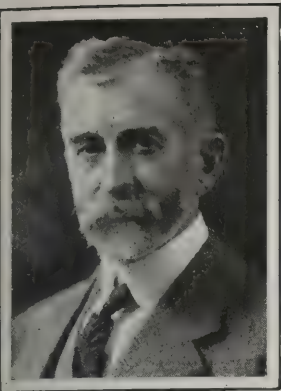
It was during his brief incumbency of this job that he conceived the idea of reconditioning the *Leviathan*, then rapidly deteriorating at her Hoboken dock. He satisfied himself that it would be a paying proposition and, with the approval of the President and the Chairman of the Shipping Board, he tackled the job in typical Powellesque manner. If any one thinks this was an easy task, just let him recall the bitter fight made by Powell's best friends in Massachusetts to have the reconditioning done in the Boston Navy Yard. Threats and entreaties availed not, as Joe was firmly convinced that the job could be done for less money and in less time at a private yard. How well it was done and how successful the large ship is panning out are facts too recent to need repetition here. By the way, in all the press acclaim of credit for this splendid reconditioning job has any one heard Joe Powell's name even mentioned as having had anything to do with it? I haven't!

Throughout the long trying months of the war these hustling shipyard leaders kept up the pace and delivered ship after ship to a world whose principal need at the time was ships, ships and yet more ships. Their earlier training, both physical and mental, stood them in good stead, and they were able to withstand the terrible pressure put upon them. Both are yet in the prime of their lives, and, if shipbuilding does not offer sufficient employment for their boundless energies, they may have to go into other lines of effort. Homer Ferguson is trying to get enthused over building box cars and automobile wheels at the Newport News plant, but he admits that anything that floats is much more attractive to him.

Perhaps this idea of "anything that floats" may account for the besetting sin of both Homer and Joe. I had almost concluded not to give these great men away as to their weaknesses. Strange to say they are both afflicted with the same shortcoming, so as a matter of candor to the readers I will have to divulge it. Its "ducks, ducks and yet more ducks" that afflicts them both. This may be and probably is because ducks float and can go through the water rapidly. However, it is well known to the intimate friends of both these men, that if either Homer or Joe should hear a duck quack or a wild goose honk, even while those shipbuilders might be negotiating a contract they would both instinctively grab a suit-case and a shot gun, and beat it for the nearest blind. When they would meet, as they formerly did quite frequently, it was not "how many keels have you laid?" but "how many 'red heads' or 'canvas backs' did you bag on your last trip to the island?"

SELF-DISCHARGING BARGE.—A novel type of tipping barge in which, by means of trimming tanks, a deck cargo consisting of about 300 tons of quarried stone may be automatically discharged to either side of the craft, was recently shipped to West Africa. It forms one of four such barges which will be used in connection with the building of a new breakwater at Takoradi by Stewart and McDonnell for the Crown Agents for the Colonies. These vessels were built at the Lytham Shipbuilding and Engineering Company, Limited, their construction and the tests on them being carried out by Flannery, Bagallay and Johnson, Limited, of London. The trimming tanks are arranged along either side and are divided into four by three transverse bulkheads. The design is so carried out that the bottom of the tanks is higher than the flotation level when the vessel is light. When loaded with deck cargo the ship is taken to the dumping site and sluice valves are opened, which admit sea water to the tanks on the side it is desired to discharge from. The barge is thus automatically careened to such an angle that the deck cargo is shot overboard, and, relieved of the weight, the vessel rises and empties the tanks.

—The Engineer.



Efficiency and Economy in Traffic Work

By Herbert Sheridan*

NOW that the country has assumed its stride and trade conditions generally have greatly improved, the obstacles that lie in the path of satisfaction are interwoven with efficiency in traffic and transportation matters, or the lack of it. The prompt and dependable movement of traffic between producer and consumer assume even larger than normal proportions. The plant expects prompt receipt of raw materials, the jobber looks for prompt movement from the mills, the country merchant wants to get his purchases without delay. All these interests include the welfare of communities that are affected when completion of public works is delayed.

Campaigns for "safety first" have accomplished much. Campaigns for prevention of claims have always produced gratifying results; but there is still much to be said and much more to be done in the way of driving the lesson home to a great many people who have not seen the vision of quicker returns on capital, greater satisfaction to customers and lessening of exasperating incidents, because common sense methods are not more generally used in getting traffic under way and properly safeguarded.

Fortunately, there has been a noticeable improvement in the plan of having a specific department take care of receipts of materials and merchandise and a shipping department more or less well equipped to insure the proper marking, billing and routing of valuable property, for which the traveling man has incurred expense and frequently secured under adverse conditions. Generally there is a lack of care in suitably preparing property for shipment. There is room for improvement in the sorting of articles, so that the classification will be observed and, when possible, articles of the same classification put into the same package. There should be a more general custom of packages containing slips, showing the name of the shipper as well as the name of the consignee.

STENCILS SHOULD BE USED FOR MARKING

The outside marking would be much more legible, if stencils were used, and although receiving agents are instructed to insist on shipments being properly marked, it is a lamentable fact that many shipments still go astray through lack of sufficient and thorough marking. Shipping orders and bills of lading should be made out on the typewriter when possible, for the sake of legibility. The one in charge of shipping should know what system of package cars prevails and so time his shipments that these can be used.

Consignees could materially aid themselves and many other interested people, carriers, producers and consumers by a much more prompt removal of property from the terminals on arrival instead of allowing terminals to be cluttered up with continued receipts of shipments.

The word "service" has come into strong play, and nowhere is it more needed than in the entire transportation game. When each man has a considerate regard for the

other and is willing to be informed about some of the difficulties that transportation companies have to contend with, in order to supply the desired service, and will give special heed to the suggestions as to his part in the desired betterment, there will be a decrease in the cost of operation and a noticeable improvement in the service the transportation companies strive to give.

TRAFFIC CLUBS

One of the most beneficial things that has come about lies in the formation of traffic clubs, wherein through membership in an organization composed of railroad men and those engaged in the manufacture and distribution of merchandise, many vital subjects are spread out for review, consideration and betterment. A spirit of tolerance has been developed, because through these traffic clubs, there has been maintained an increased knowledge of some of the hardships that are peculiar to the subjects of traffic and transportation. There are also organizations of standing that are imparting instruction about these subjects; among the most prominent is the LaSalle Extension University of Chicago. This organization has a large staff of instructors, competent to impart much valuable information and it has the endorsement and friendly regard of a number of prominent officials in the traffic field.

All that is said about some of the inland difficulties apply with equal force to the constantly growing coastwise steamer traffic. Many shippers are anxious to determine which is the better way to reach their remote customer, that is, whether to send shipments to the Atlantic seaboard for movement through the canal, thence to a Pacific coast port and by rail to an inland point; or ship all-rail as heretofore. Fortunately, tariffs are available that define the classifications applicable, the rates in cents per one hundred pounds, the transfer and other terminal charges at ports and rates to the interior, so that the uncertainty as to comparison of cost can soon be removed. Other coastwise steamer service involves a knowledge of service rendered by the different companies, schedules of their sailings, tariffs showing rates between interior and coast ports, as well as port to port rates. Specific information, including the subject of insured rates, can always be obtained from the nearest representative of the various lines. Water transportation is receiving more and more attention, and very properly so, because with the rapid growth of our country, railroad building has not kept pace with developments. Increased reliance has been placed on water movement, which has reacted greatly to the advantage of many sections of the country.

GYRO-COMPASS COURSE FOR BRITISH OFFICERS.—Owing to the growing importance of the gyro compass in the navigation of modern ships, every British naval officer who has qualified in the navigation of first class vessels is required to go through a gyro-compass course of two weeks' duration at the Admiralty Compass Observatory, Ditton Park, Langley, Bucks. Those that have had gyro instruction are required to take refresher courses at intervals of three years.

*Traffic manager, Merchants and Miners Transportation Company, Baltimore, Md.



New Wilson Line Excursion Steamer State of Delaware

Two Excursion Steamers Built for the Wilson Line

**New System of Construction Increases Strength and Reduces Vibration —
Features Introduced for Safety, Comfort and Entertainment of Passengers**

TWO new excursion steamers, the *State of Delaware* and *State of Pennsylvania*, plans and specifications of which were prepared by the George G. Sharp Company, naval architects and consulting engineers, 30 Church Street, New York City, have recently been built by the Pusey & Jones Company, Wilmington, Del., for the Wilson Line of Wilmington and placed in operation on the Delaware River.

The addition of these two new steamers to the line have enabled the management to provide a much more frequent schedule between Philadelphia, Riverview Beach and intermediate points. Two and one-quarter hours are consumed in the Riverside Beach run, a distance of about thirty-five miles, each vessel making two round trips per day and in the evening a moonlight excursion down the river from Philadelphia.

The Wilson Line's policy is to keep their regular passenger fleet up to date by the addition from time to time of new vessels specially adapted to their requirements and embodying the latest developments in the field of naval architecture. Their steamers have invariably been in advance of their time, and it is already apparent that the latest additions to the line fully maintain the reputation and traditions of the company. The long experience and intimate knowledge of the service made available to the architects by Captain Horace Wilson and Mr. J. S. Wilson of the Wilson Line has resulted in a design being developed which marks a distinct advance in the economics of operation and structural design.

NEW TYPE OF CONSTRUCTION INTRODUCED

Since the conditions of service limited the extreme length of these vessels to 225 feet it is obvious that the difficulties attendant upon providing ample space, unobstructed vision and means of entertainment for 3,500 passengers in a comfortable atmosphere were not inconsiderable, nor would they have been overcome by reproducing the type of excursion steamer to which we have become accustomed. The means whereby results have been achieved are of interest by reason of the advance they mark in the methods of construction.

Instead of adopting the usual method of superimposing one deck upon another a new system of trussed lattice framing was developed whereby all the structural members from the bottom of the hull to the uppermost superstructure deck were assembled into a single rigid unit. The resultant structure is as solid and free from vibration as the superimposed type is conducive to this source of discomfort so frequently met with in passenger steamers of light construction.

Although these two vessels have equal capacity to the combined regular fleet of four vessels in the Wilmington-Philadelphia service, their daily fuel consumption in service, it is reported, has shown an economy of over thirty-five percent when compared with that of the original fleet.

STRUCTURAL ARRANGEMENT

The hull is constructed on a special system of trussed lattice framing, consisting of wide spaced deep frames and beams up to the first superstructure deck with steel tie beams at each of the superstructure decks above, combined with continuous columns run from the main frames or deck beams to the uppermost deck of the superstructure. These columns are in one piece, or efficiently jointed as may be necessary for loading or other local conditions, and along with the diagonal members are riveted at all intersections of beams, frames or floors. The complete frame units were erected and regulated ready to receive the intermediate frames and fore and aft steel girders. When these had been erected the intermediate beams and carlins of the superstructure decks were erected, thus permitting the construction to proceed on all or as many decks as was found desirable.

It should be noted that the familiar guard braces have been dispensed with, the truss construction of the main framing satisfactorily supporting the overhanging sides of the main deck.

The shell plating is overlapped at the butts and seams, but the main deck is laid flush to receive Rubberstone decking with which it is covered.

The boiler casing is of steel extending to the boat deck

General Data: New Wilson Line Excursion Steamers

General Information		Life Saving Equipment		Feed water heater—1, No. 16, Reilly Type G.	
Service: Delaware River and Bay Excursion Service.		No. Type Length Capacity		Fuel oil heaters—3, 12" x 50", Coen.	
Builder: Pusey and Jones Company, Wilmington, Delaware.		Lifeboats 6 Steel 24—0 41		Pumps:	
Owner: Wilson Line, Wilmington, Delaware.		Working boats 1 Steel 16—0 —		Circulating—1, 12" suction, 10" discharge, 9" x 9"	
Characteristics		Life rafts 4 Steel 21—0 34		Engberg Eng., Pusey & Jones Co., fan pumps.	
Length, overall 225' 0"		Total..... 11		Bilge—1, 6 x 6 x 6, Warren vertical duplex.	
Length, B. P. 219' 0"		Ring buoys 6 Cork Luminous		Sanitary—1, 6 x 6 x 8, Warren vertical duplex.	
Breadth, molded, main deck 48' 9"		Life preservers.... 3,550 Cork		Feed pumps—2, 10 x 7 x 24, Warren vertical duplex.	
Breadth, molded over guards 59' 0"		Propelling Machinery		Oil feed—2, 6 x 3½ x 6, Warren hor. duplex.	
Breadth, molded at waterline 45' 9"		Boilers		Fresh water—1, 5¼ x 4¼ x 5, Warren vertical duplex.	
Depth, molded 13' 7"		Number 2		Brine pumps—2, 4½ x 3¼ x 4, Warren vertical duplex.	
Draft 9' 6"		Type Babcock & Wilcox, watertube		Ice water—3, 4½ x 2¼ x 4, Warren vertical duplex.	
Speed, loaded, statute miles 18		Furnaces 5 per boiler		Hot water—1.	
Traming Trussed lattice		Fuel oil		Refrigerating Machinery:	
Class American Bureau of Shipping		Draft assisted		1 Remington five-ton unit.	
Deadweight capacity 360 tons		Total heating surface, sq. ft. 7,478		5 Warren duplex pumps.	
Equipment		Working pressure, lbs. per sq. in. 210		Electric Equipment:	
Anchors:		Normal fuel consumption		Generators, 2 sets of 15 K.W., General Electric.	
2 Bowers stockless 1,050 lbs. each		At full speed 400 gallons per hour		Emergency, battery.	
Chain:		Normal steam production, lbs. per hour per pound of fuel 13½		Refrigerated Space	
Length 90 fathoms 1 1/16 stud link		Engines		Compartment: Cu. Ft.	
2 hawsers 50 fathoms 7" Manila		Number One		Ship's stores, restaurant stores, refreshment booth (cabinets, etc.), soda fountains.	
4 hawsers 25 fathoms 6" Manila		Type Triple exp., 4 cylinder		Fuel Oil Bunkers	
Complement		Horsepower 2,900		Compartment: Cu. Ft. Tons Gallons	
Deck officers 4		Propellers		Forward port 406 10.6 2,972	
Deck crew 16		Number One		Forward starboard 406 10.6 2,972	
Engineer officers 3		Type solid		After port 406 10.6 2,972	
Engineer crew 5		Diameter 9' 4"		After starboard 406 10.6 2,972	
Purser's and steward's department 14		Pitch 14' 3"		Peak Tanks and Deep Tanks	
Total officers and crew 42		Auxiliary Machinery		Cu. Ft. Tons F.W.	
Total passengers 3,500		(Number, Size, Type)		Fore peak 720 20	
Total complement 3,542		Machinery Space:		After peak 397 Dry	
Deck Machinery		Condensers—1, 5' 6" D x 7' 10½" L, surface condensing, 3244 5/8" ODS tubes, two-pass.		Deep tanks 648 18	
(Number, Size, Type)		Filters, tank—1, 5' 7" x 4' 0" x 3' 0".		Deep tanks 792 22	
Steering gear, 1, 6x6, steam—drum type.					
Windlass, 1, 7½ HP., electric driven vertical with capstan.					
Capstan, 1, 7½ HP., electric driven.					
All American Engineering Company make.					

and is insulated to the height of the observation deck. The engine room is open, having a steel casing around the hatch extending to a height of about three feet above deck.

The hull below the main deck is subdivided by five transverse steel bulkheads into six watertight compartments as follows: Fore peak, forward compartment, boiler room, engine room, after compartment and after peak. The fore peak is arranged for the carriage of reserve feed water.

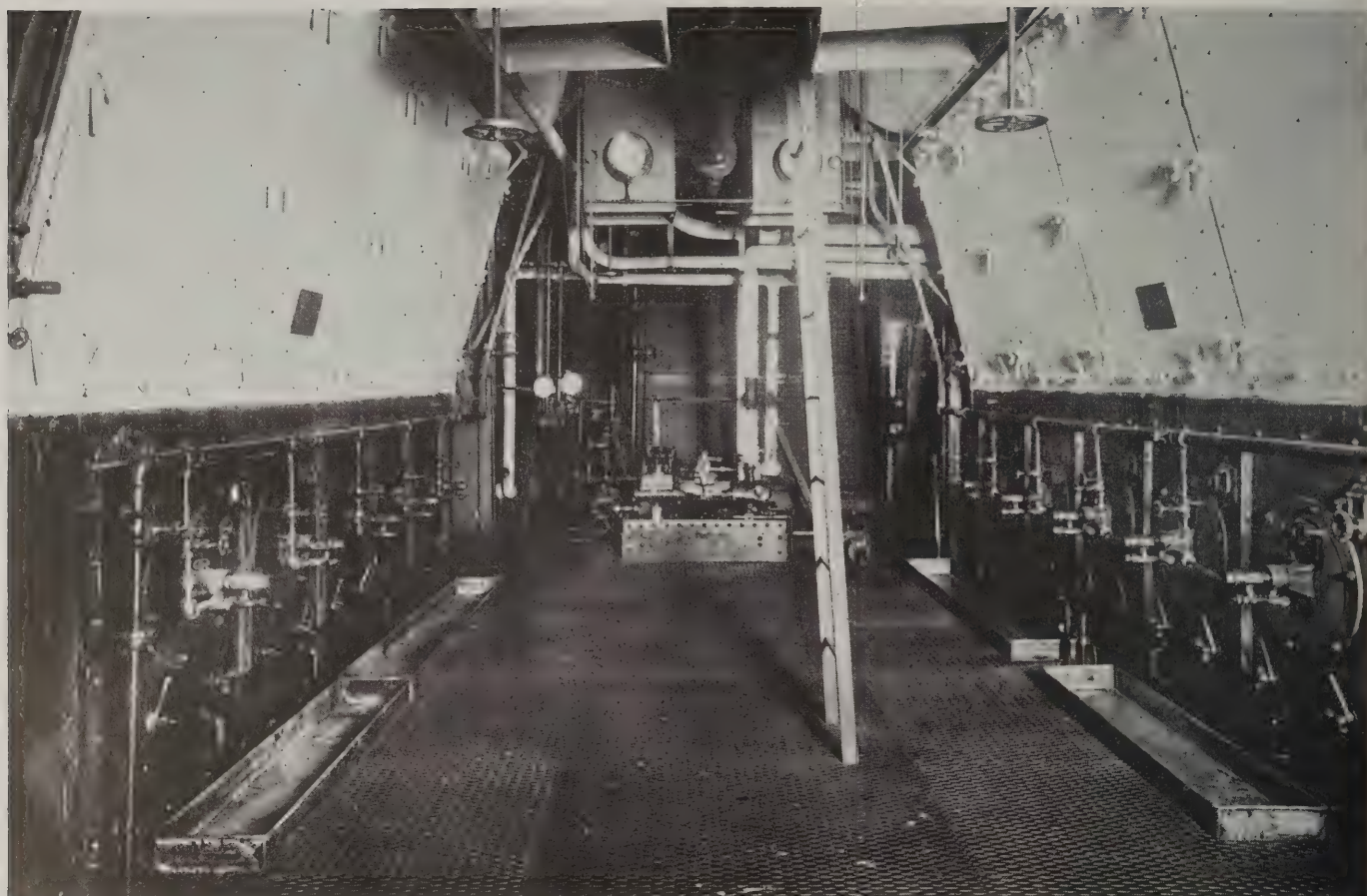
CREW

In the forward compartment on the lower deck is arranged the kitchen, pantry, ships' provision and refrigerated

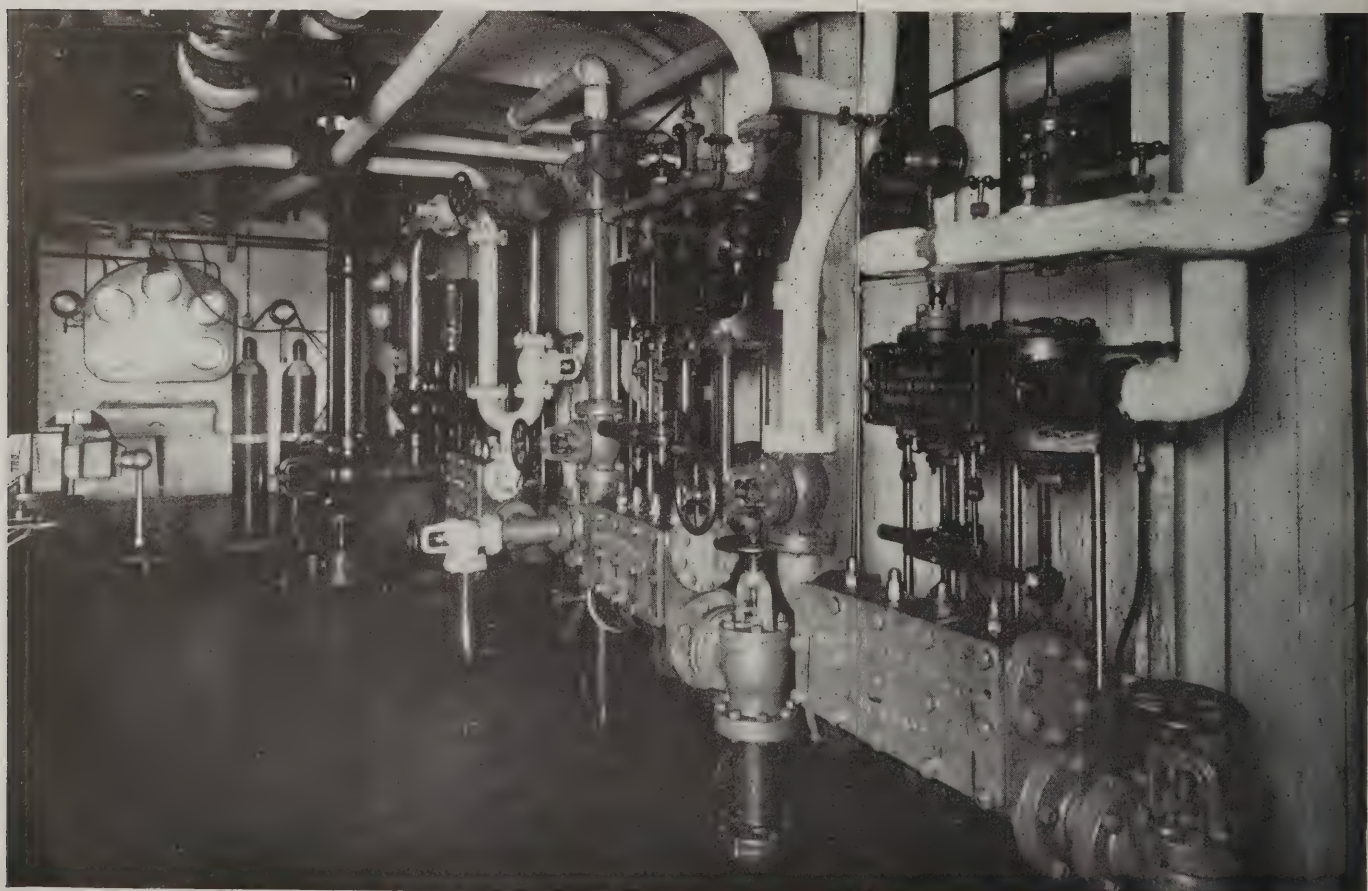


Bow View of S. S. State of Delaware in Dry Dock

Stern View of S. S. State of Delaware in Dry Dock



Boiler Room



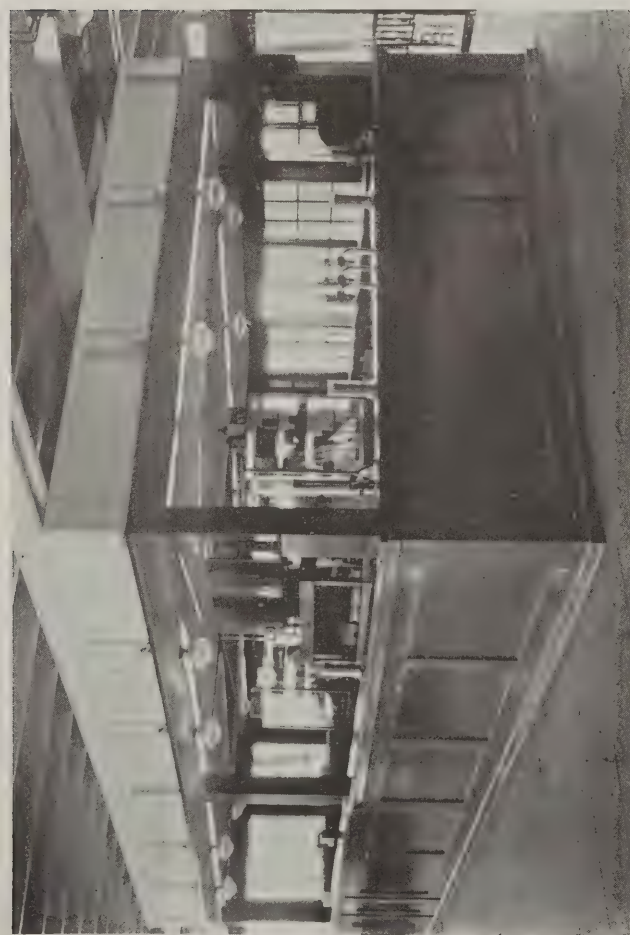
View in Engine Room Showing Fresh Water, Sanitary, Bilge and Fire Pumps



Observation Deck, Looking Aft



View on Saloon Deck Showing Dance Floor



Refreshment Booth on Saloon Deck



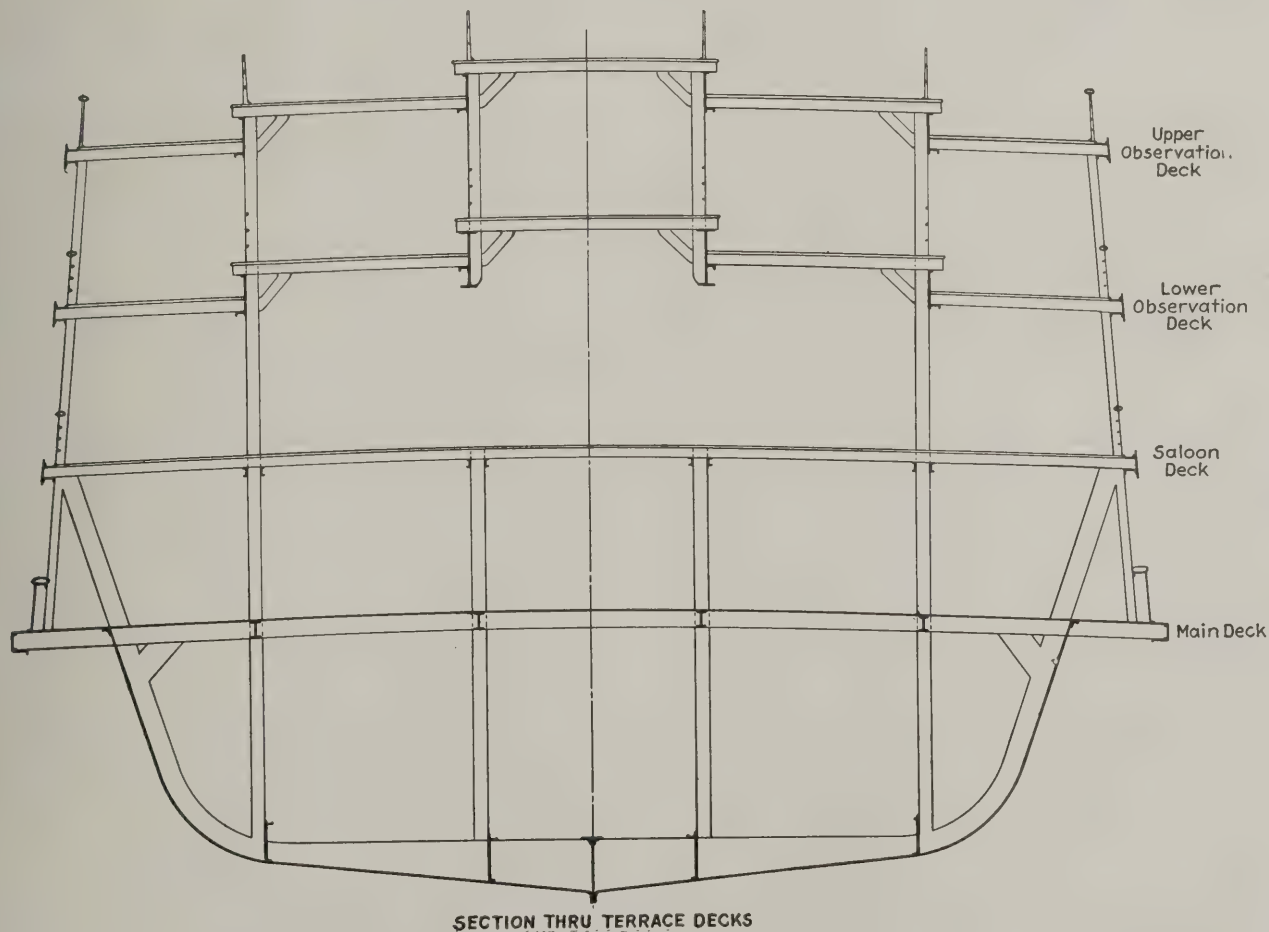
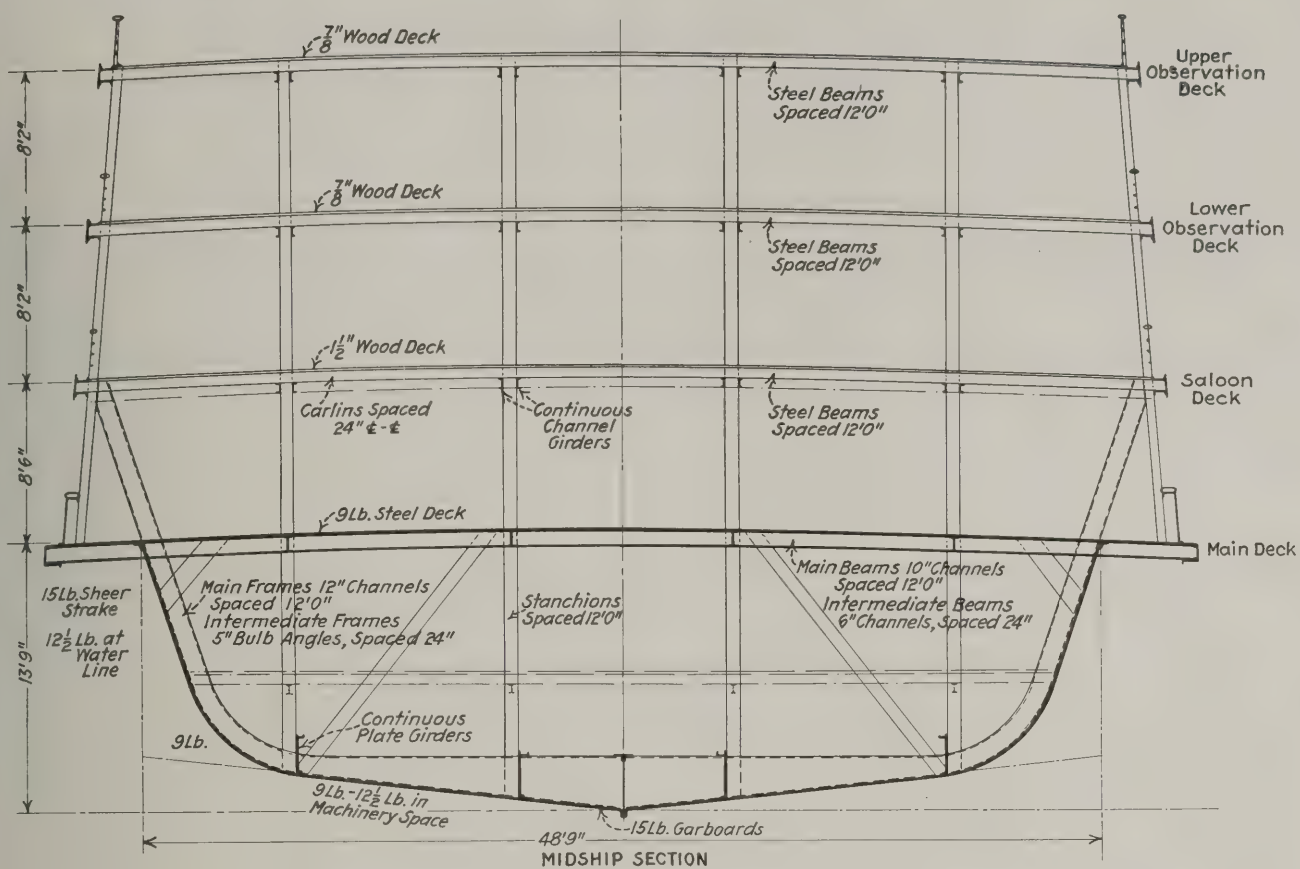
Interior of Refreshment Booth on Main Deck



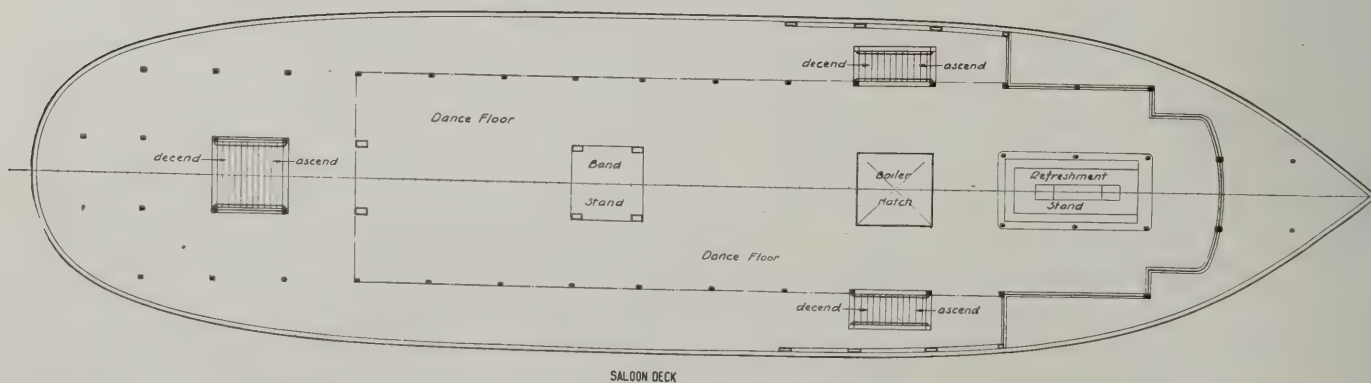
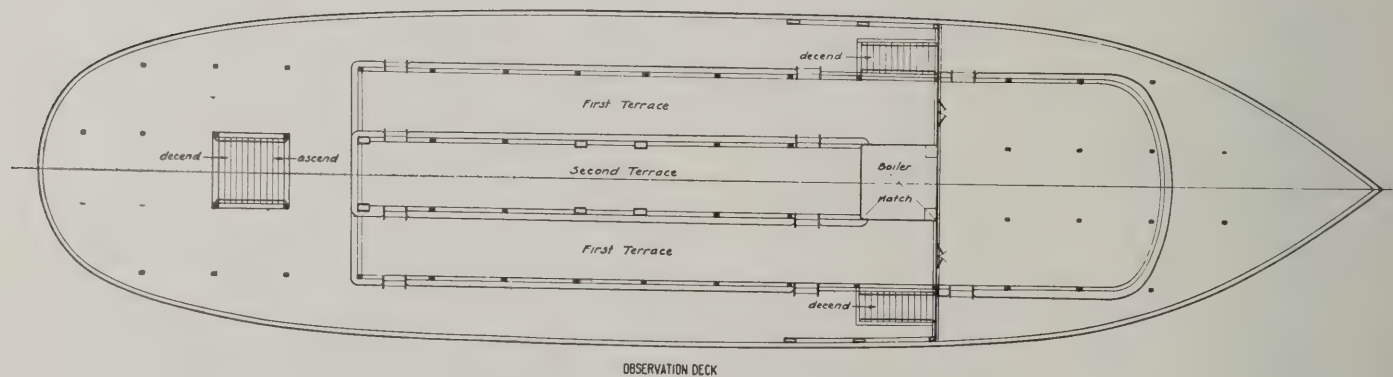
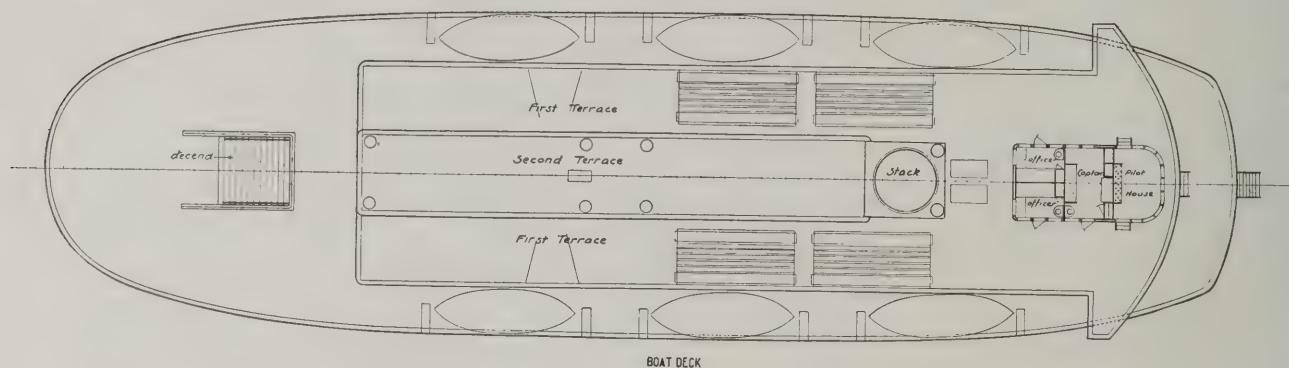
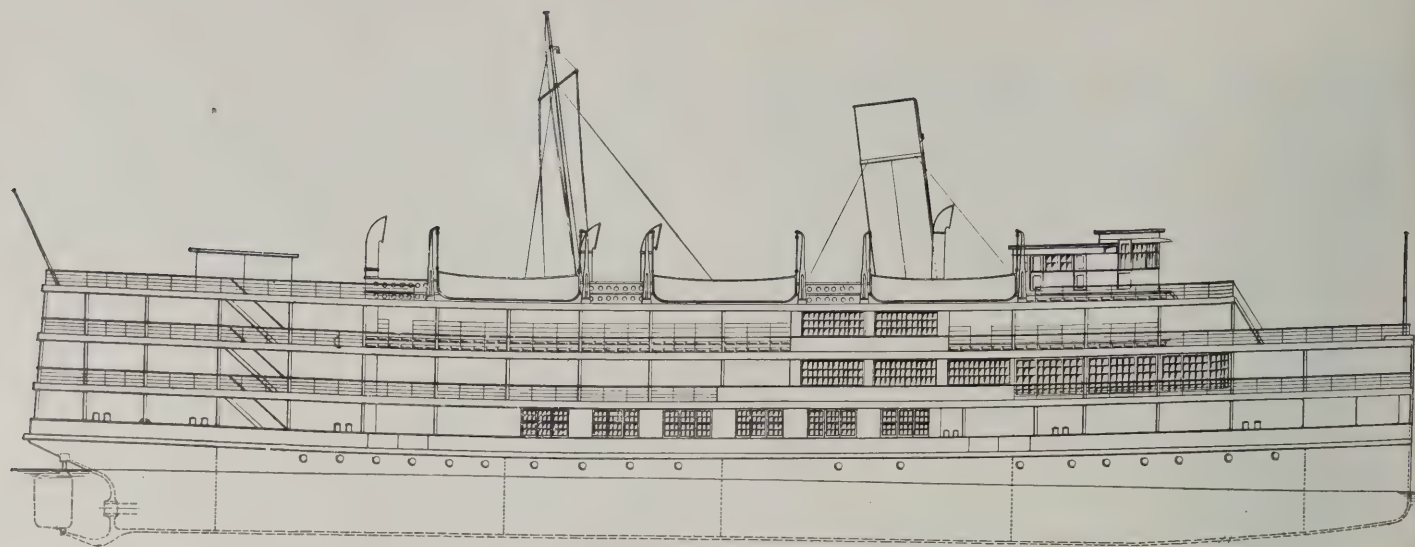
Boat Deck



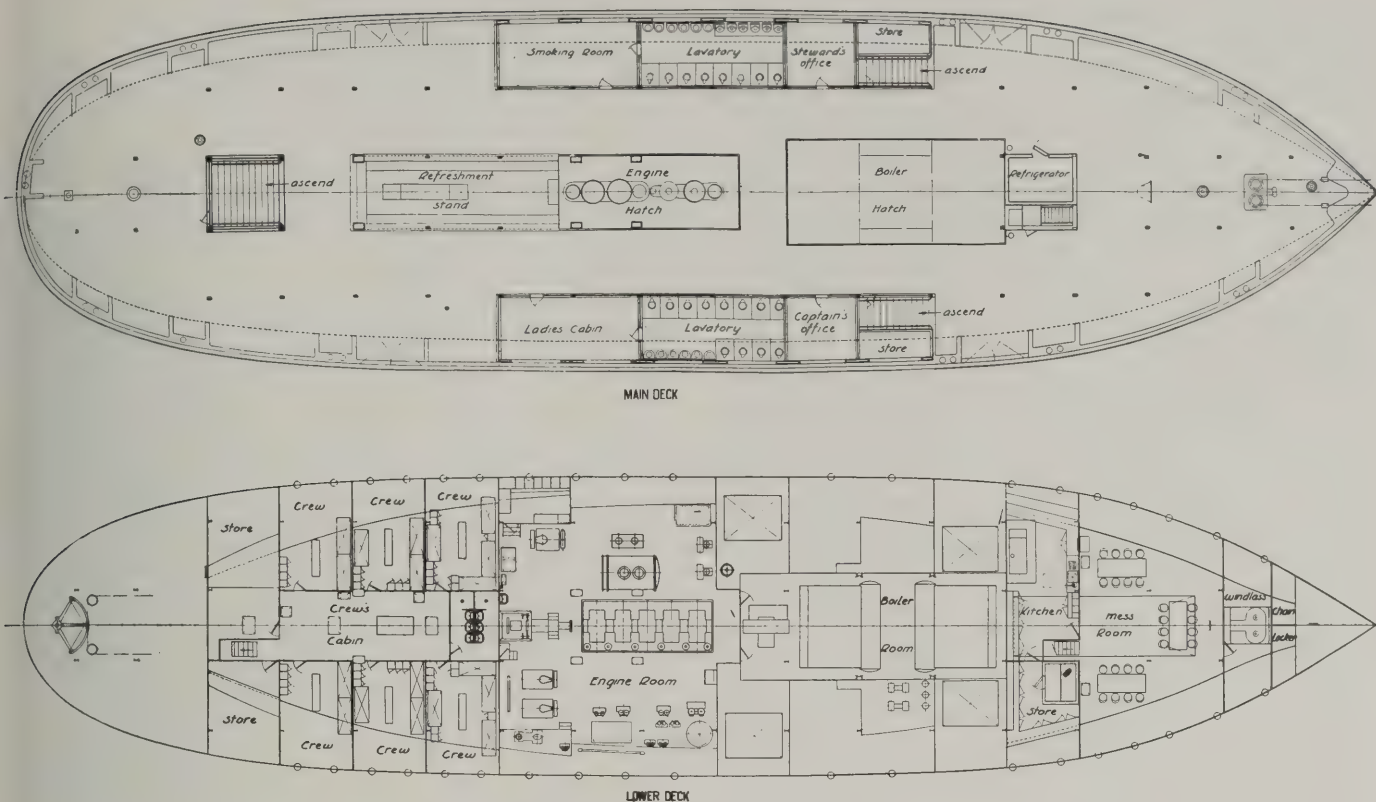
Observation Deck, Looking Forward



Midship Section and Section Through Terrace Decks



General Arrangement Plans of New Wilson Line Excursion Steamers

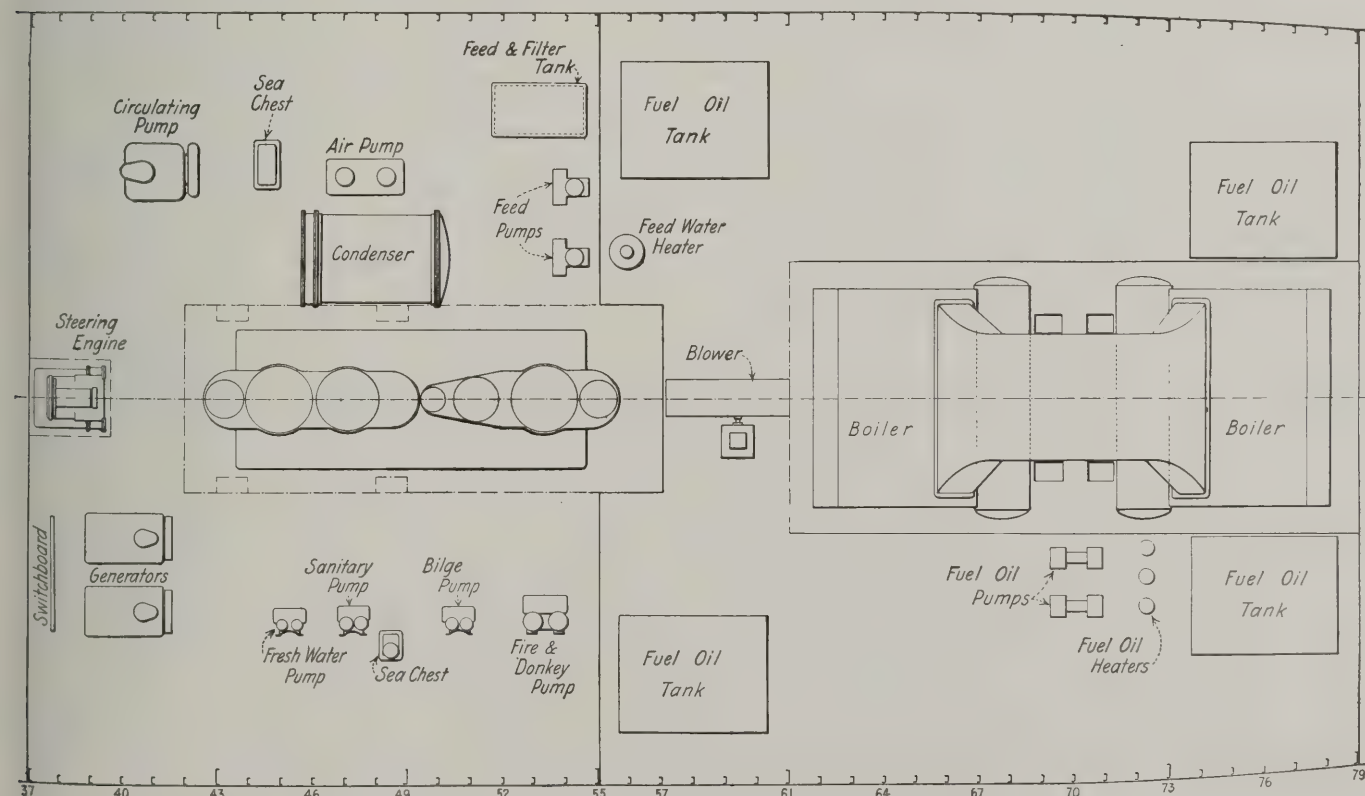


Plans of Main and Lower Decks

rooms and mess room, while below the lower deck are the culinary fresh water tanks. In the compartment abaft the machinery space, accommodation is provided for the engine, deck and steward's department crew.

Above the main deck, with the exception of space occupied by the pilot house, officers' quarters and life-saving ap-

pliances on the boat deck, the remainder of the vessel is arranged for the accommodation of the passengers, 3,500 being the complement. There are four decks in all, viz.: main, saloon, observation and boat decks. Ample seating capacity and comfortable deck space is provided for all passengers and terraced observation decks ensure a perfect view, light



Enlarged Plan of Machinery Space

and ventilation for everyone on board regardless of their location.

With the exception of enclosures around the forward stairways and the refreshment booth on the saloon deck the sides are all open and fitted with rails only. Protection from the weather, when necessary, is provided by means of canvas drop weather screens fitted completely around the vessels.

The central portion of the saloon deck is reserved for dancing. The floor is approximately 35 feet by 90 feet without obstruction of any kind other than a bandstand, which is centrally located. The terraced decks over this part of the vessel give additional height which is about 12 feet at the center and 10 feet at the sides.

REFRESHMENT BOOTHS

At the forward end of the saloon deck there is a large refreshment booth enclosed, along with forward stairways, within a glass weather screen, while on the main deck aft a similar refreshment booth is fitted. The furnishing of these booths is most complete, and their 165 feet of serving counter provides adequately for the passengers' service without the attendant discomfort so frequently experienced due to crowding and delay.

At the forward end of each booth are plate glass and mahogany display cases fitted flush with the sides of the booth and blending with the mahogany sides and serving counter of the booth proper.

STEERING, NAVIGATING AND HANDLING APPLIANCES

Steering.—A partly balanced rudder of the double plate type is fitted with an extension stock carried to the boat deck where an emergency steering gear has been arranged for controlling the tiller through tackle connected to a drum operated by a hand steering wheel. The main quadrant is fitted on the rudder stock at the under side of the main deck having direct leads to the steering engine in the after engine room by means of rods and chains. The steering engine is operated by a wheel in the pilot house through the usual mechanical shaft control which is carried along the boat deck and down the engine room ventilator to the steering engine. The steering engine is of the American Engineering Company's 6-inch by 6-inch, two-cylinder, steam-driven drum type.

Windlass and Anchors.—The windlass, which is located on the main deck, is of the double vertical type driven electrically by a $7\frac{1}{2}$ horsepower, 125 volt, direct current, General Electric motor through spur and worm gearing. The motor and gearing are mounted on the same bedplate on the deck below and drive the two wildcats and capstan on the deck above through vertical shafts.

There are two stockless anchors of 1,050 pounds each housed on bevelled skids ready for release and 90 fathoms of 1 $\frac{1}{16}$ -inch stud link cable.

Capstan.—There is an electrically driven capstan on the main deck aft actuated through spur and worm gearing by a $7\frac{1}{2}$ horsepower, 125 volt direct current General Electric motor. The motor and gearing are on one bedplate attached to the underside of the main deck driving the capstan barrel above through a vertical shaft.

Mooring Bitts.—There are six mooring bitts on each side and one on the center line aft, making thirteen in all. These are of a special type made of bronze and mounted on top of the bulwark rail.

Signal Mast.—A signal mast is fitted amidship, carrying a signal yard and range light. A head light is fitted on the stem head with the port and starboard running lights at the sides of the navigating bridge.

Communication.—Communication to the engine room is by the usual inland mechanical bell system. Communication by speaking tube with mechanical call bells is also provided from the pilot house to the engine room.

APPLIANCES FOR SAFETY AND LIFE SAVING

Subdivision.—The main hull is divided transversely into six watertight compartments, there being five complete steel watertight bulkheads to the height of the main deck and two steel longitudinal watertight bulkheads from the top of the floor level to the lower deck, forming deep tanks for fresh water.

Life Saving.—On the boat deck there are six 24-foot metallic lifeboats and four large life rafts, with a working boat on the main deck forward. The lifeboat capacity is considerably in excess of the requirements of the service and Steward patent mechanical davits have been installed to insure prompt and efficient handling of the lifeboats in an emergency.

Life preservers are supplied for all on board. These are stowed between the beams on the under sides of the three upper decks along the sides of the vessel and are capable of being instantly released in an emergency. Cords are run fore and after through the beams and suitably spaced to provide two cords for the support of each row of life preservers. At the end of each row these cords are brought together and made fast on cleats so that by releasing the cords any row or rows of preservers instantly fall to the deck.

There are also stowed in convenient locations twelve cork ring life buoys, six of which are of the self-igniting luminous type.

Fire Prevention.—In the matter of fire prevention every precaution has been taken by the use of fire resisting materials eliminating wood as far as practicable. The whole superstructure is framed completely in steel. The main deck along with the machinery and boiler casings is completely of steel while the cabin enclosures and their internal bulkheads are constructed of Plymetal as manufactured by the Haskelite Corporation. There are several types of Plymetal, but that used on these vessels is of the double-faced type, which is a combination of Plywood and steel composed of a three-ply panel to which is added two faces of thin double galvanized stretcher leveled sheet steel.

While every effort has been made in the construction of these vessels to make them fire resisting, the most modern and effective means of fire fighting have been adopted to meet any emergency. In addition to the regular water fire system with outlets and hose at suitable points throughout the vessel a number of patent tanks have been installed, each containing water or a chemical supply for the first six fire buckets contained therein.

A further precaution has been taken by the installation of a Foamite hose pressure system in these vessels. The system consists of two riveted steel tanks, having a capacity of 300 gallons of solution each, from which separate pipes are led to Foamite hose stations located on the starboard side of the boiler room, on the forward bulkhead on the starboard side of the engine room and on the bulkhead of the boiler casing on the main deck. The solutions are expelled from the tanks by nitrogen under a pressure of 40 pounds per square inch. Seamless drawn steel cylinders are used as containers to hold this nitrogen at a pressure of 2,000 pounds per square inch. The cylinders are connected by means of flexible couplings to a high pressure manifold located in the engine room near the fireroom entrance door and the main control valve for the operation of the system is installed at this manifold. Gages are fitted to both the high pressure and the low pressure sides of the manifold, as well as on each solution storage tank. An arrangement of valves has been provided, so that the system may be readily flushed out with water; and charged after it has been used.

REFRIGERATING PLANT

The refrigerating plant consists of the following:

1 Remington Machine Company 5-ton unit compressor, having cylinders $4\frac{1}{4}$ inches diameter by 9 inches stroke, the engine having a diameter of 7 inches and a stroke of 7 inches. Both the engine and compressor are on the same base.

1 Liquid ammonia receiver.

1 Ammonia condenser 12 feet long by 19 pipes high.

2 Warren duplex vertical steam pumps, each $4\frac{1}{2}$ inches by $3\frac{3}{4}$ inches by 4 inches for circulating drinking water.

1 Warren duplex vertical steam pump, $4\frac{1}{2}$ inches by $2\frac{3}{4}$ inches by 4 inches for circulating water through the ammonia condenser, the sanitary pump being connected for use as emergency.

1 Brine tank with direct expansion coils of 500 gallons capacity.

1 Scuttle butt for drinking water, with direct expansion coils of 400 gallons capacity. A water spray system over the ammonia parts is installed with a distant valve control for use in case of emergency.

The refrigerating plant takes care of the soda fountain and soft drink cabinets in both refreshment booths, an ice cream cabinet having a capacity for fourteen five-gallon reserve ice cream containers, the refrigerator for cold storage on the main deck forward and the refrigerator for steward's supplies adjoining the galley, in addition to drinking water which is obtainable from six fountains other than those at the refreshment booths and from faucets in the galley and engine room.

VENTILATION

Ventilation is provided for the mess room, kitchen and store rooms forward by three ventilators through the main deck with an exhaust ventilator from the galley carried into the stack casing. The crew's quarters aft receive their supply of fresh air through large cowl ventilators on the boat deck carried through trunks. The lavatories have exhaust ventilators led into the fan casing in the boiler room. A constant supply of fresh air to the various rooms contained in the main deck enclosures, port and starboard, is provided through shielded grills above the windows when these are closed. The canopy over the forward refreshment booth has an exhaust duct which is led into the stack casing. There are four 24-inch diameter cowl ventilators to the engine room and two of 30 inches diameter to the boiler room.

ELECTRIC EQUIPMENT

The main generating equipment consists of two 15 kilowatt General Electric generators connected in parallel, though one generator has sufficient capacity for the normal load. The main switchboard is located in the engine room and has mounted upon it the necessary switches to control the dynamos, search light, running lights, power circuits for the deck machinery along with feeders to auxiliary lighting circuit panels. All the main feeders are of armored cable while the lighting circuits are either of armored cable or carried in metal conduits to suit the local conditions.

The fixtures generally are of the ceiling type with enclosed Holoplane globes which, in the more exposed places, are of the watertight type. The complete electric and communicating equipment installation was carried out by Charles Cory and Son, Inc., New York.

PROPELLING MACHINERY

The main engine is of the four cylinder, triple expansion, direct acting surface condensing type with cylinders 24, $37\frac{3}{4}$, 44 and 44 inches diameter by 30 inches stroke, designed for a working pressure of 200 pounds per square inch and developing 2,900 horsepower at 155 revolutions per minute with independent condenser and pumps. The thrust bearing is of the Kingsbury type.

BOILERS

Each vessel is equipped with two Babcock and Wilcox marine watertube boilers each having 3,739 square feet of heating surface, or a total of 7,478 square feet, with furnaces arranged for oil fuel. The boilers are 23 sections

wide, each section having $7\frac{1}{2}$ clusters of four 2-inch tubes, with one 4-inch tube over the furnace, the tubes being 9 feet long.

Each boiler is equipped with five Babcock and Wilcox mechanical atomizing oil burners, Buyama design, arranged to operate under forced draft. The blower delivers the necessary air to the duct surrounding the oil burners, formed by the inner and outer front plates of the boiler, the outer front plate being so designed that the burners can be operated with natural draft, if necessary.

Coen three unit 12 by 50 steel construction cleanable oil heaters of the latest design have been installed. With these heaters the oil passes between an inner and outer element, and there are no coils, the absence of which is one of the noteworthy improvements in this heater, permitting of cleaning with the least amount of trouble and delay.

The fuel oil strainers for both the suction and discharge side are the Coen duplex type, with double baskets which have a combined area approximately eight times the cross sectional area of the pipe. A single 90-degree turn of the handle changes from one basket to the other basket allowing the strainer to be cleaned while the burners are in operation.

FORCED DRAFT SYSTEM

Each ship is equipped with one 78-inch double inlet Howden forced draft fan driven by one 7-inch by 5-inch Howden enclosed forced lubrication engine.

The fan units are situated in the boiler room just aft of the boilers and deliver the air into ducts passing below the boilers. The boiler fronts are so arranged that, by moving dampers, the furnaces will be supplied with air either under natural draft alone, with natural draft assisted by forced draft or entirely by forced draft.

Owing to the solid central plate construction of the Howden fan it has been possible to use one inlet of the fan to ventilate the lavatories, etc., in the upper part of the ship, the other inlet taking the warm air from the engine and boiler rooms. Running on forced draft, the fan units, which are somewhat larger than necessary, are capable of running the boilers at high rating, thus giving a reserve which can be called on in emergency.

AUXILIARIES

There are two 10-inch by 7-inch by 24-inch vertical single main feed pumps operating against a working pressure of 210 pounds per square inch in the boilers. The pump ends are of cast iron heavily brass lined and brass fitted and are of the valve pot type in which the entire valve service is readily removed for inspection or repairs. The steam valve gear is of the well known Warren "Eclipse" type in which the main slide valve is mechanically operated instead of entirely steam thrown.

The feed water is heated by a Reilly type G, number 16 marine feed water heater.

There is one 10-inch by 22-inch by 15-inch main air pump of the vertical twin single-acting type having cast iron pump cylinders, brass lined and brass fitted. The head and foot valve decks are of brass as well as the pump buckets. The pump valves are of the multi-disk phosphor bronze type. Ample size handhole plates are provided in the suction and discharge chambers and also in the plunger barrels to permit of easy access to all valves.

The circulating pump, supplied by the Pusey & Jones Company, has a 12-inch suction and 10-inch discharge and is direct connected to a 9-inch by 9-inch Engberg vertical engine.

There is one 6-inch by 6-inch by 6-inch Warren vertical duplex piston pattern bilge pump having cast iron pump cylinders fully brass fitted. The pump cylinders are designed for 150 pounds per square inch pressure.

There is one 10-inch by 7-inch by 12-inch vertical duplex

(Continued on page 569)

Great Lakes Freighter Frontenac

Latest Addition to the Fleet of Lake Freighters Has Many Features, Including a Special System of Ballast Tanks and Pumping Arrangements

ON May 26 the 12,000 deadweight ton freight steamer *Frontenac* was launched at the River Rouge (Michigan) yards of the Great Lakes Engineering Works. This vessel which is to be used as a freight steamer was subsequently delivered to the owners, the Cleveland-Cliffs Steamship Company, Cleveland, Ohio, on July 28.

Since freighters in Lake service run rather to standard types, the improvements in design, construction and equipment in the case of the *Frontenac* have been more or less in minor details—the greatest innovation being in the construction of the ballast tanks and the method of equipment for handling the water ballast. Details of the system are given in a later section of the article.

The principal dimensions of the vessel are as follows:

Length overall	605 feet
Length on keel	580 feet
Beam, molded	60 feet
Depth, molded	32 feet
Deadweight carrying capacity at 20-foot draft, about	12,000 long tons
Water ballast capacity	6,700 long tons
Gross tonnage	8,158
Net tonnage	6,531
Service speed about	12 knots

TYPE OF CONSTRUCTION

The hull is of arch girder construction with a forecastle deck and pilot house forward. The machinery spaces are

located aft and here also are the coal bunkers and ship supply tonnage.

The cargo hold is divided into four compartments. The cargo hatches numbering eighteen in all are 38 feet wide, 12 feet long fore and aft and are spaced 24 feet on centers. The hatch covers are of the steel telescopic type, fitted with Mulholland fasteners and operated by wire cables which are led along the deck with portable posts and fixed cleats to the steam deck engines amidships.

Water ballast is carried in both the side and bottom tanks, the side tanks being separate from the bottom tanks.

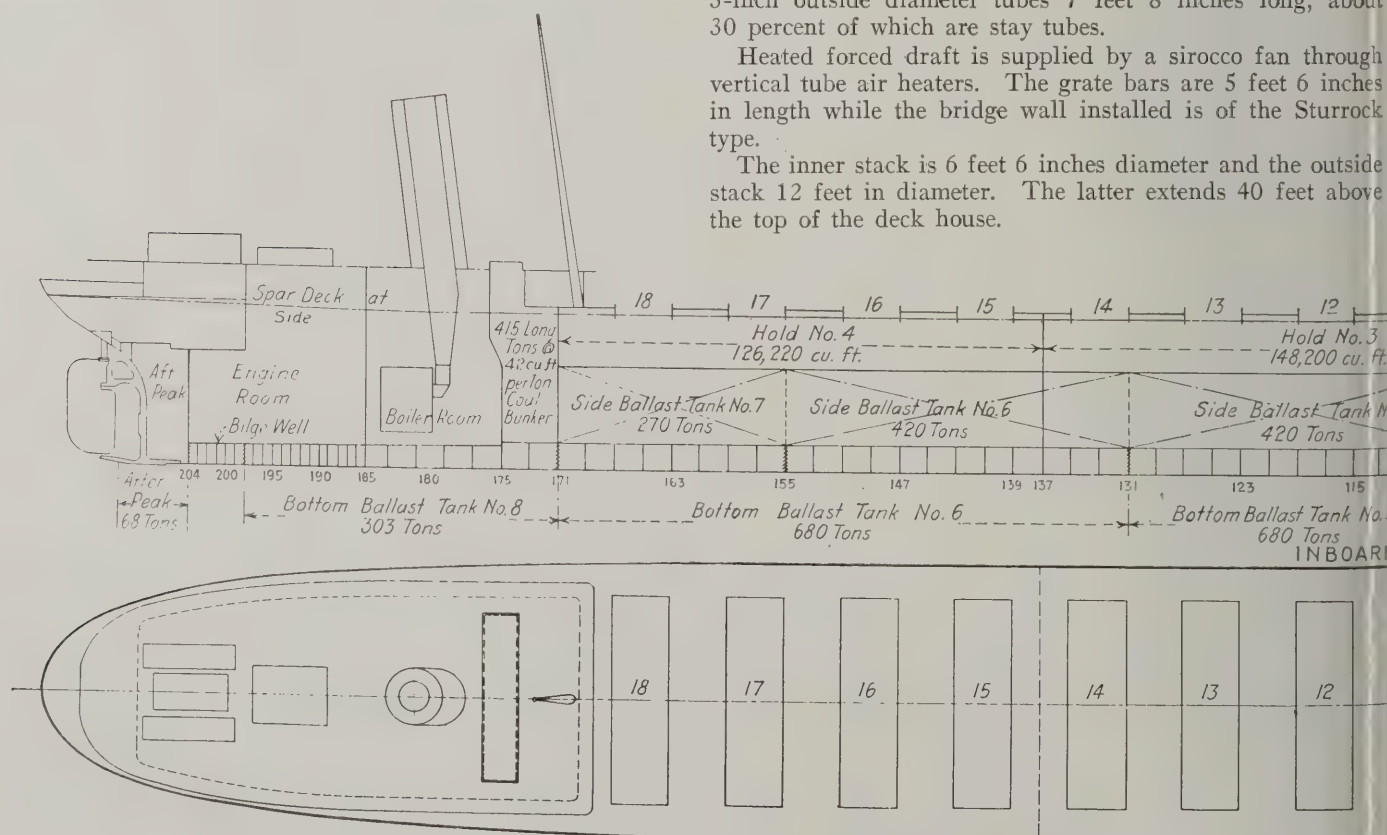
DETAILS OF PROPELLING MACHINERY

Steam for the propelling machinery and auxiliaries is supplied by three Scotch boilers 13 feet 6 inches diameter by 11 feet 3 inches long, constructed to pass the requirements of the United States Bureau of Steamboat Inspection and of the American Bureau of Shipping, for a working pressure of 180 pounds per square inch. Each boiler has two corrugated furnaces 50 inches inside diameter and each furnace a separate combustion chamber.

The boiler shell is rolled from a single plate and has two longitudinal joints with double butt straps of equal width. The circumferential end seams are double riveted. The front head is made from a single plate $1\frac{1}{8}$ inches thick eliminating all doublers and horizontal joints. The back head is made in the same manner. Each boiler has 294 3-inch outside diameter tubes 7 feet 8 inches long, about 30 percent of which are stay tubes.

Heated forced draft is supplied by a sirocco fan through vertical tube air heaters. The grate bars are 5 feet 6 inches in length while the bridge wall installed is of the Sturrock type.

The inner stack is 6 feet 6 inches diameter and the outside stack 12 feet in diameter. The latter extends 40 feet above the top of the deck house.



PLAN

Inboard Profile and Spar Deck

Total heating surface—3 boilers.....	6,261 square feet
Total grate surface—3 boilers.....	137.25 square feet
Ratio heating surface to grate surface.....	45.7 to 1
Air heater heating surface	2,364 square feet

MAIN ENGINE

The main engine is a vertical triple expansion, three crank engine having cylinders 24½, 40 and 65 inches in diameter with a stroke of 42 inches. At 82 revolutions per minute normal speed this engine develops 1,900 indicated horsepower. The low pressure cylinder is placed at the forward end of the engine, the intermediate at the after end and the high pressure in the center with its valve chest on the out-board side of the cylinder. The high pressure valve is actuated through a rocker arm. This engine is about 18 inches less in overall length than an engine of equal size having cylinders and valve chests in line. The high pressure and intermediate pressure valves are of piston type and the low pressure valve is a double ported slide valve.

The high pressure and intermediate pressure piston have deep removable followers and the low pressure piston is fitted with one ring having flat springs fitted behind it. This ring is clamped between the follower and piston body making what is practically an adjustable plug piston.

The crosshead is of cast steel with brass shoes. The upper ends of the connecting rods are of the gib and key type with bronze boxes while the lower end has cast steel boxes lined with Ackermite bearing metal.

There are four front columns and three guide columns of box type all made of cast iron. The crank shaft is of the built-up type with cast steel slabs and is supported by four babbitt lined journals. All valves are operated by Stevenson link motion, the high pressure being operated through a rocker arm. The thrust bearing is of the ordinary horse shoe type.

The propeller is of cast iron, of the sectional type with four blades, having a diameter of 15 feet 0 inches, a pitch of 13 feet 9 inches and a developed area of 83 square feet.

AUXILIARY EQUIPMENT

The feed equipment consists of one horizontal simplex 14 inches by 8 inches by 16 inches main feed pump, one horizontal duplex 6 inches by 4 inches by 6 inches pump for feeding boilers in port, three injectors, one multi-coil feed water heater and three Learmouth type purifiers. The purifiers are 42 inches diameter and approximately 8 feet high.

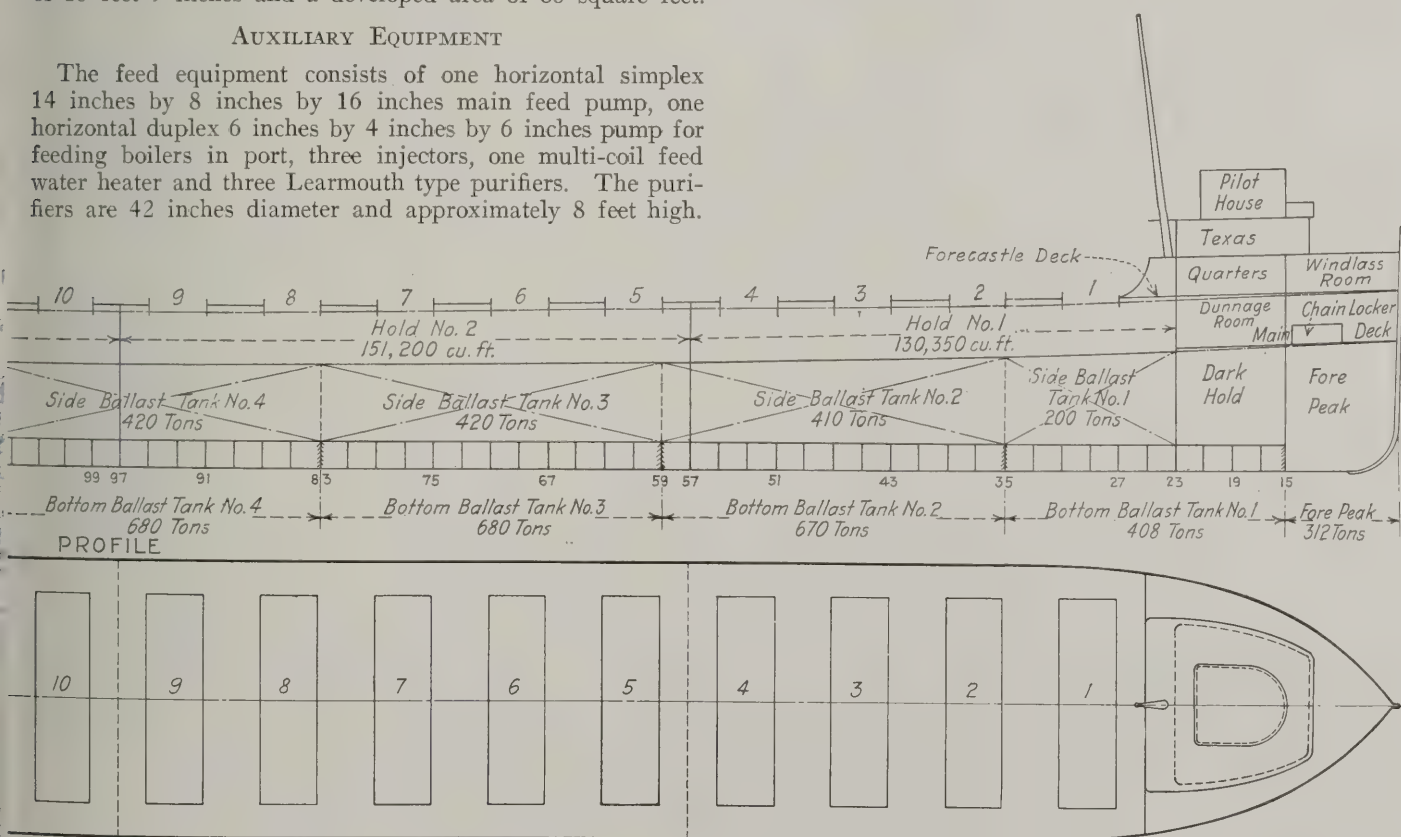
Both top and bottom heads are of flanged steel. The entrance to the purifier is gained through a 12 inches by 16 inches manhole in the top head. Cleaning hand holes are also placed along the sides. The feed pumps take their suction from a feed tank installed in the engine room. The water supply for this tank is obtained from the discharge of the air pump and is augmented by the drains from the feed water heater and miscellaneous traps.

The general service pump is a 12 inches by 6 inches by 12 inches horizontal duplex and may be used for fire, feed and ash gun service. The mates' pump is a horizontal duplex 6 inches by 4 inches by 6 inches pump and is used for deck washing service. The sanitary pump is a horizontal duplex 6 inches by 4 inches by 6 inches pump. The main air pump is a vertical simplex combined air pump and jet condenser, size 18 inches by 36 inches by 24 inches.

The lighting equipment consists of two 15 kilowatt and one 10 kilowatt engine driven generators.

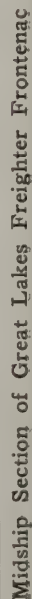
BALLAST SYSTEM

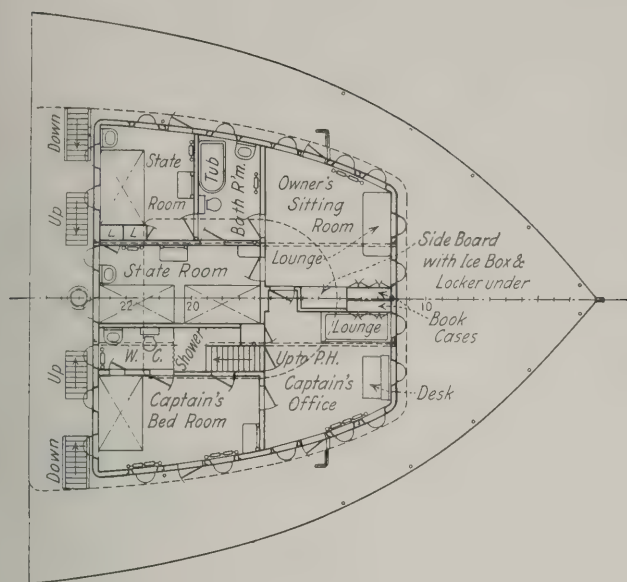
There are eight bottom ballast tanks divided at the center-line and seven port and seven starboard side tanks. The bottom tanks are piped through separate pipes in the double bottom to a double type manifold in the engine room, so that the tanks may be filled, emptied or water transferred from one tank to another at will. There is a fore and aft header on each side of the ship with connections to each side tank. Eight-inch angle shut-off valves, operated from the deck are placed at each tank. The piping system is so arranged in the engine room that the side tanks may be pumped full at the same time that the bottom tanks are being filled from the sea by gravity. This arrangement materially cuts down the time required for ballasting. The ballast pumps consist of two 14-inch centrifugal pumps of 6,000 gallons per minute capacity, and two 10 inches by 14 inches by 12 inches horizontal duplex pumps.



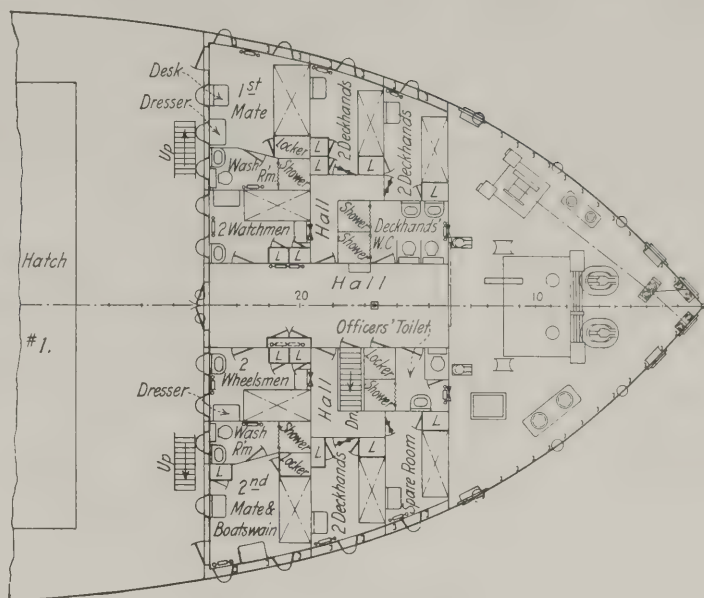
PAR DECK

New Great Lakes Freighter Frontenac

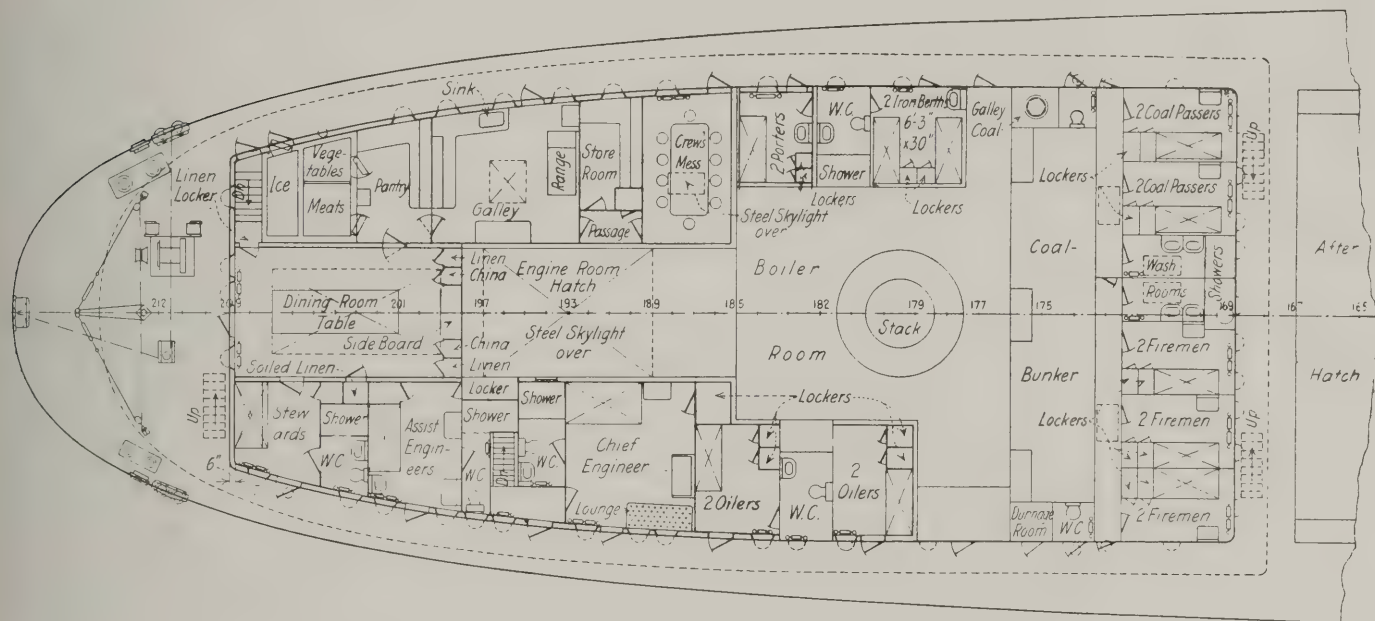




TEXAS TOP



SPAR DECK FORWARD



AFTER DECK

Accommodation Plans of the Freighter Frontenac

ACCOMMODATIONS

The propelling machinery, and commodious quarters for engineers, the steward's department, oilers, firemen and deckhands' are located in the after end of the ship. At the forward end is a sitting room and two staterooms for the owners, the captain's office and stateroom, pilot house; quarters for the mates, etc. The finish in the owners' staterooms is white enamel and the sitting room, dining room and officers' quarters are finished in oak.

Intercoastal Cargoes Increasing

THE Bureau of Research, United States Shipping Board, issued recently figures showing the movements of cargoes between the east and the west coasts of the United States for the first six months of 1923. The total cargo so moved amounted to 5,644,837 tons. Three-fourths of this movement was from the west coast to the east coast, and five-sevenths of this eastbound movement was composed of tank ship cargoes of petroleum. Leaving out the bulk oil traffic,

1,430,790 tons moved to the west coast, and 1,059,534 tons were brought to the eastward.

Los Angeles leads all the individual ports in quantity handled in this trade, her total being 3,727,240 tons against New York's 2,652,600. Los Angeles also stands first among the Pacific ports, both in eastbound and in westbound traffic, considered separately. On the Atlantic New York is foremost in amount of intercoastal cargo tonnage entered, while Baltimore leads in quantity cleared.

The rank of the first ten ports of the United States in intercoastal movement only—coastwise and foreign traffic not considered—is as follows, for the half-year: Los Angeles, 3,727,240; New York, 2,652,600; San Francisco, 795,987; Philadelphia, 749,354; Baltimore, 742,894; New Orleans, 332,261; Seattle, 263,141; Portland, Ore., 238,548; Boston, 223,649; Tacoma, 173,314.

To the already phenomenal growth of the intercoastal cargo trade there will undoubtedly be added a healthy gain to this route as to means of travel for passengers between the east and west coasts.

Influence of the Bulbous Bow on Resistance

Results of Recent Investigations at Government Model Basin Showing Effect of Varying Bow Slope of Sectional Area Curves

By Rear-Admiral D. W. Taylor, U. S. N. (Retired)*

FOR nearly twenty years the battleships of the United States Navy have been designed with bulbous bows because in the early days of the Model Basin at Washington searching for improvement in form we concluded that the bulbous bow, uncouth as it appeared, served to reduce battleship resistance. The bulbous bow was not altogether the result of hit or miss methods. Somewhere in the literature of ship resistance I had seen reference (by Mr. William Froude, I believe) to a so-called swan model having full but narrow water lines close to the bow succeeded by an almost parallel section which was followed again by lines swelling out to a normal form. The theory seemed to be to have first a false bow as it were, corresponding to a small ship. This would create a small bow wave and in its hollow was located the second or true bow, making a second bow wave that would neutralize the first.

We were never able to make a swan model that drove more easily than the usual form but the bulbous bow rather grew out of this research. Its idea was to fine the water line as much as possible and put the displacement removed from the vicinity of the water line as far below water as possible.

So instead of a fine bow forward with a second full bow abaft it we had a fine bow at the water line as it were and a full bow near the keel.

BULBOUS BOW NOT PATENTED

No attempt was made to patent the form or keep it confidential. In "Speed and Power of Ships," published in 1910, the Standard Series lines, the basic lines for a large

*Former Chief Constructor, United States Navy.

number of models used to investigate variation of resistance with variation of size, proportions and longitudinal fullness, were shown with a moderate bulbous bow. Concerning the bulbous bow I said in "Speed and Power," pages 93 and 94:

"It may be pointed out that experiments show a ram bow of bulbous type to be favorable to speed, even apart from the fact that the ram bow usually involves a slight increase in effective length. This is simply because the ram bow, which is the extreme case of the U bow, is much fuller below water than at the water line. The excess pressures set up around the ram being well below the surface are more absorbed in pumping the water aft, where it is needed and less absorbed in raising the surface and producing waves than if the same displacement were brought close to the surface."

So far as I know only one merchant vessel has ever been built with a bulbous bow and I am not sure that the venturesome marine superintendent who took a chance on it concluded that he had gained a faster ship by its use.

RECENT TESTS AT GOVERNMENT MODEL BASIN

We never made a thorough investigation of this bulbous bow matter during my time at the Model Basin. While it was kept in mind as one of the jobs to be taken up when a slack time came, somehow the slack time seemed never to come. But Captain Eggert, now in charge of the Model Basin, has recently finished some extensive tests in the field where I made a small beginning years ago and the results seemed so interesting to the naval architect that I sought and obtained permission of Admiral Beuret—the Chief Constructor of the Navy—to write them up. They throw much light not only upon the bulbous bow question but also upon an allied question of importance—namely, the effect upon

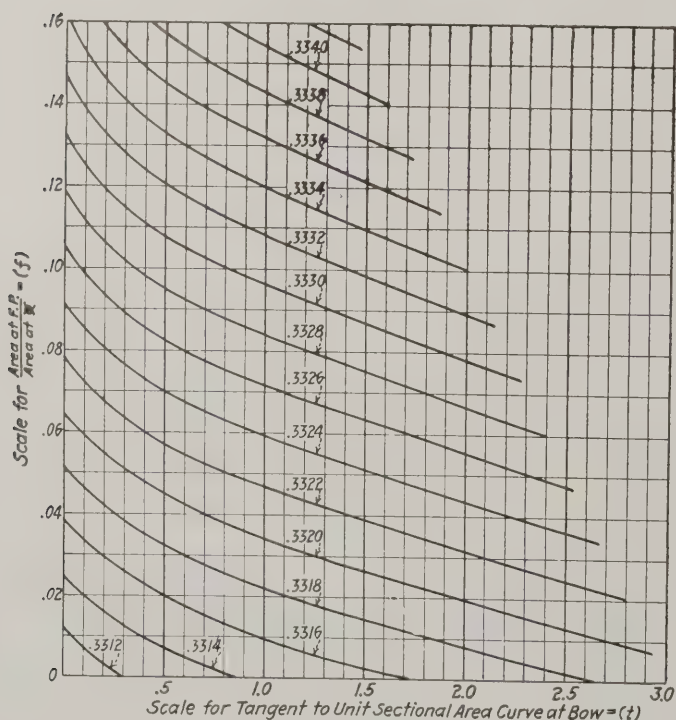


Fig. 1.—Series A. Contours of Wetted Surface Coefficients $= C.W.S. = C\sqrt{P} \times L$, Where P = Displacement of Model in Pounds and L = Length in Feet (P is for Fresh Water)

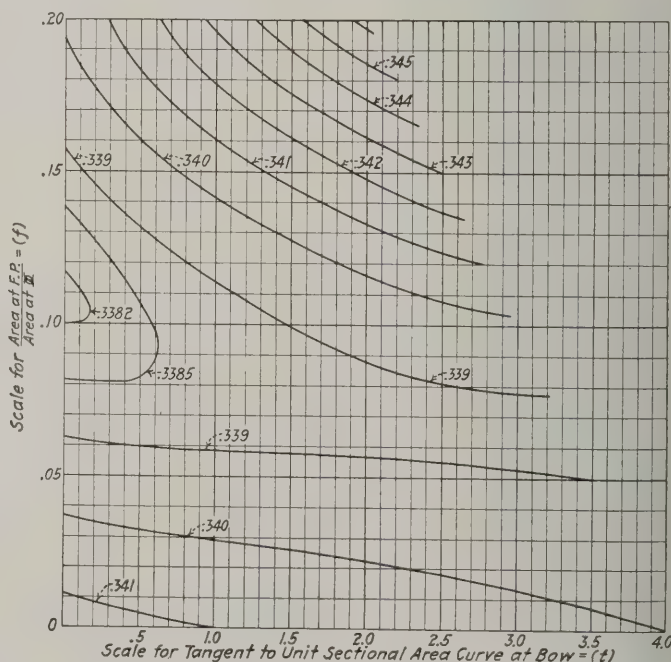


Fig. 2.—Series B. Contours of Wetted Surface Coefficients $= C.W.S. = C\sqrt{P} \times L$, Where P = Displacement of Model in Pounds and L = Length in Feet (P Is for Fresh Water)

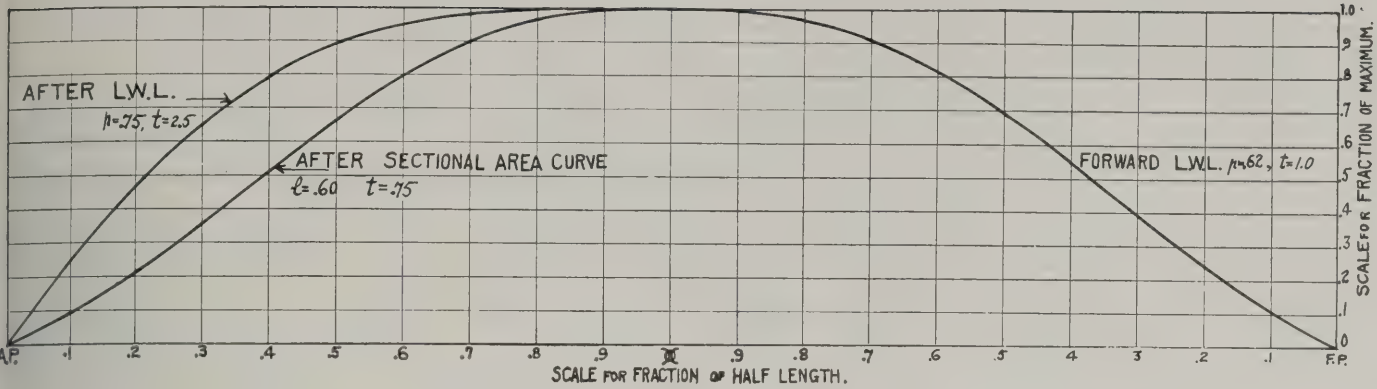


Fig. 3.—Series A

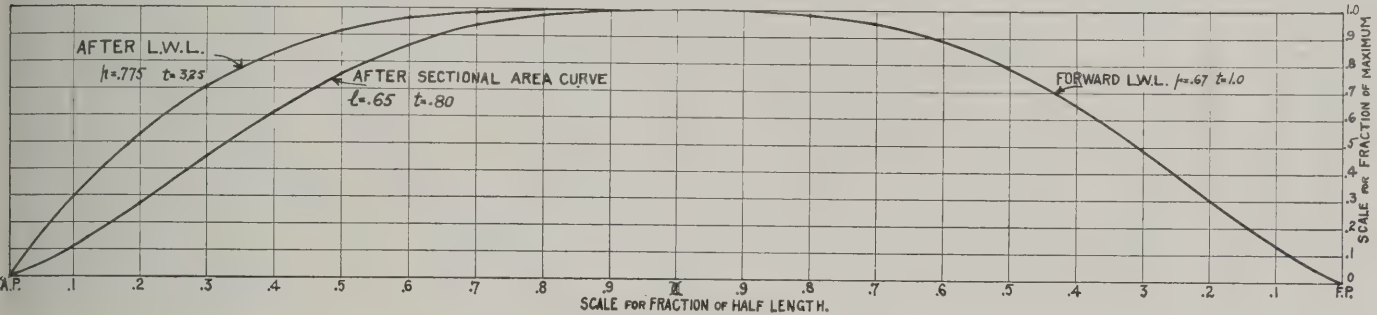


Fig. 4.—Series B

resistance of varying the bow slope of curves of sectional area.

In what follows, this slope is expressed by a quantity *t* obtained as follows, for the normal form, where the ordinate of the sectional area curve is zero at the bow or fore perpendicular:

Draw the tangent at the bow to the curve of sectional areas. This will cut the vertical at the center of length, intercepting on it a certain ordinate. Then *t* is the ratio be-

tween this ordinate and the ordinate of the sectional area curve at the center of length.

HOW THE BULBOUS BOW IS EXPRESSED IN FIGURES

Now we need to express the bulbous bow in figures, so to speak. This is done as follows: The sectional area curve instead of coming to zero value at the fore perpendicular has an ordinate there, representing an area at the fore per-

TABLE I

Model No.	Wetted Surface in Sq. Ft.	t	f
2,155	48.00	.30	0
2,156	48.03	1.20	
2,157	48.07	2.10	
2,158	48.10	3.00	
2,159	48.09	.26	.04
2,160	48.12	1.04	
2,161	48.15	1.82	
2,162	48.19	2.60	
2,163	48.17	.22	.08
2,164	48.21	.88	
2,165	48.24	1.54	
2,166	48.27	2.20	
2,167	48.26	.18	.12
2,168	48.29	.72	
2,169	48.33	1.26	
2,170	48.36	1.80	
2,386	48.35	.14	.16
2,387	48.38	.56	
2,388	48.41	.98	
2,389	48.45	1.40	

Series A—Constants for All Models

Length	20 feet
Beam	2.283 feet
Draft	0.681 feet
Displacement	P = 1,050 lbs.
Longitudinal coef.	1 = .60
Midship section coef.	m = .92
Disp. length ratio	$\frac{\Delta}{\left(\frac{L}{100}\right)^3} = 60$
Ratio beam to draft	$\frac{B.}{H.} = 3.35$
Coef. of L.W.L. For'd.	p = .62
Coef. of L.W.L. aft.	p = .75

TABLE II

Model No.	Wetted Surface in S.q Ft.	t	f
2,382	78.23	0	0
2,351	78.16	.40	
2,352	78.08	1.60	
2,353	77.98	2.80	
2,354	77.90	4.00	.05
2,383	77.84	0	
2,355	77.78	.35	
2,356	77.74	1.40	
2,357	77.70	2.45	.10
2,358	77.68	3.50	
2,384	77.48	0	
2,359	77.51	.30	
2,360	77.60	1.20	.15
2,361	77.74	2.10	
2,362	77.88	3.00	
2,385	77.64	0	
2,363	77.72	.25	.20
2,364	78.00	1.00	
2,365	78.30	1.75	
2,366	78.60	2.50	
2,414	78.50	.80	.20
2,415	78.07	.20	
2,416	77.64	-.40	

Series B—Constants for All Models

Length	20 feet
Beam	3.232 feet
Draft	1.01 feet
Displacement	P = 2,625 lbs.
Longitudinal coef.	1 = .65
Midship section coef.	m = .99
Disp. length ratio	$\frac{\Delta}{\left(\frac{L}{100}\right)^3} = 150$
Ratio beam to draft	$\frac{B.}{H.} = 3.2$
Coef. of L.W.L. for'd.	p = .67
Coef. of L.W.L. aft.	p = .775

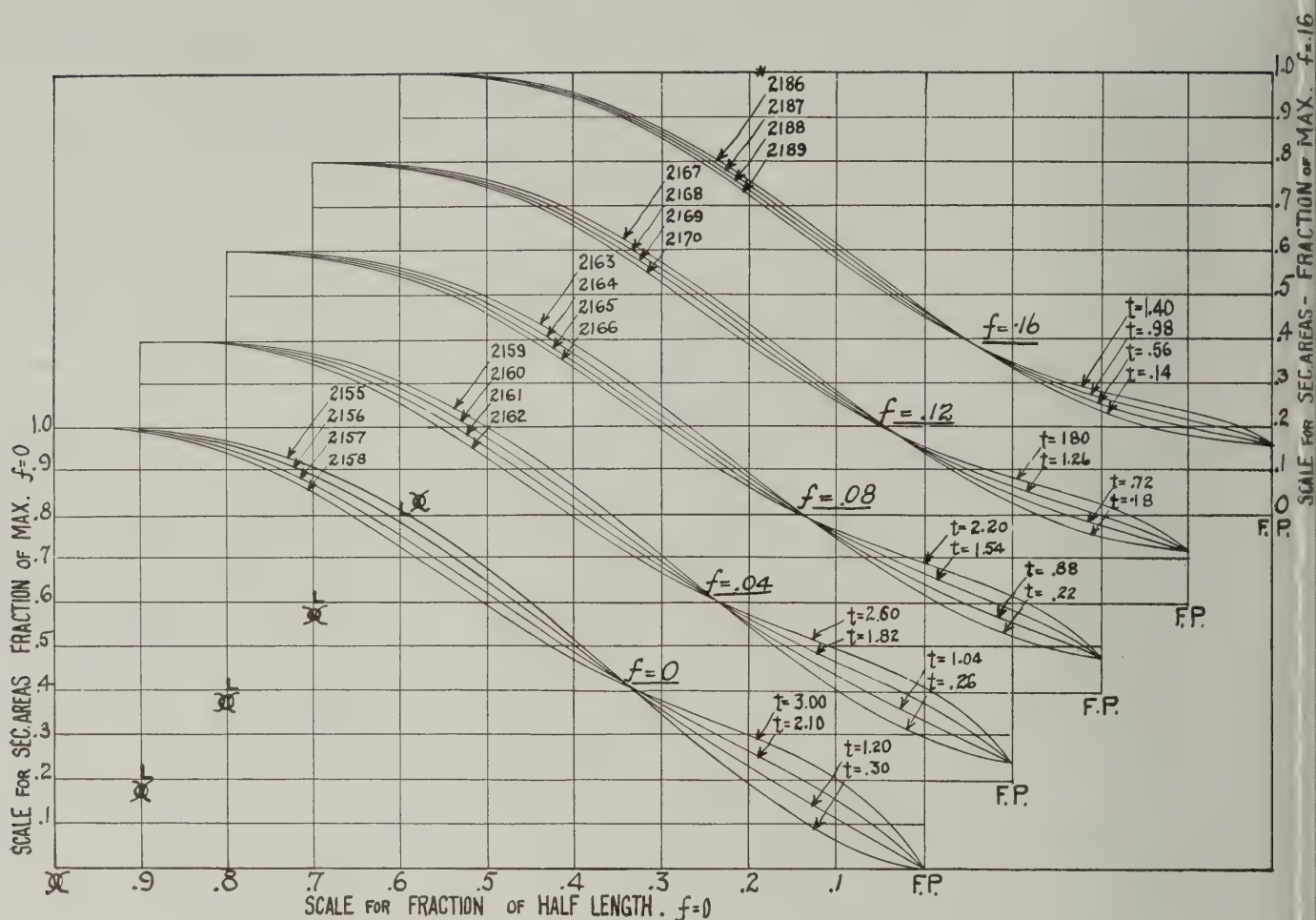
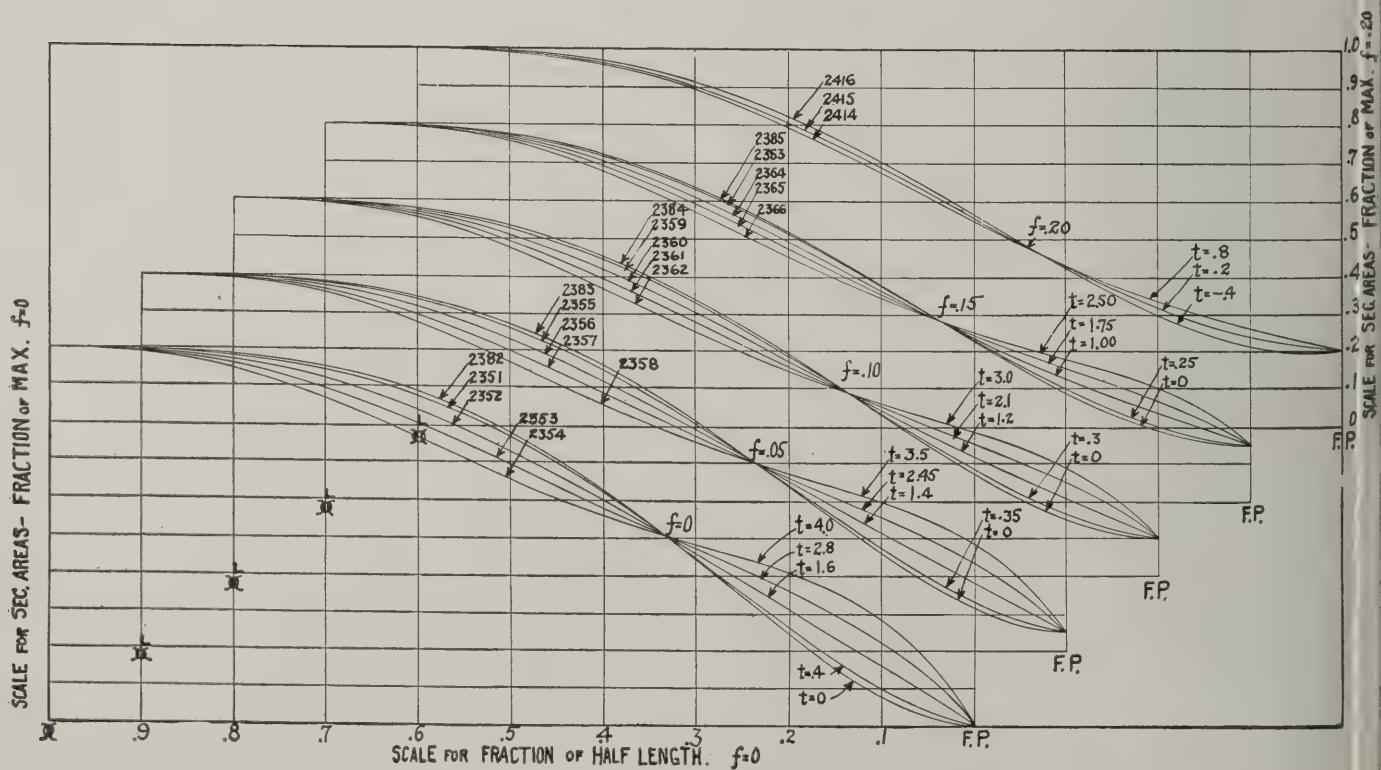
Fig. 5.—Series A—Sectional Area Curves— $l = 0.60$ Fig. 6.—Series B—Sectional Area Curves— $l = 0.65$



Fig. 7.—Series A



Fig. 8.—Series B

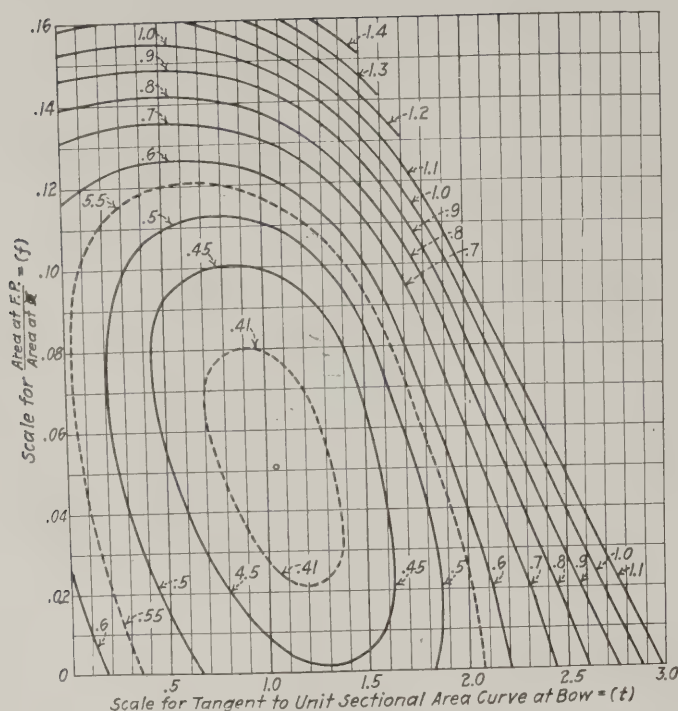


Fig. 9.—Series A. $\frac{R_r}{\Delta} = 3.7$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.559$

pendicular and the extent of bulbousness, if it may be so called, is expressed by the ratio between this fore perpendicular area and the area of the midship section. We thus have the shape that would be found, if we designed a ship with a very long under water ram and then cut it square off at the fore perpendicular.

However, we do not test a model with a square nose in front. Having made it as described above, the ends of the water lines are rounded in circular form, the radius varying with each line so that the circular termination passes through the fore perpendicular and is tangent to the water line of the square nosed form. In the figures the bulb section at the fore perpendicular is shown before rounding the corners thus corresponding to the actual section a short distance—a very short distance indeed—abaft the fore perpendicular.

In what follows the symbol f is used to denote the bulb area at the fore perpendicular expressed as a fraction of the area of midship section.

When f has a value it is necessary in order to determine t correctly to deduct f from both the midship ordinate of the tangent at the bow and the midship ordinate of the curve of sectional areas and then proceed as before.

FEATURES OF BULBS TESTED

Now what were the features of the bulbs tested? They are best characterized by the sections at the fore perpendicular. These are made tangent to the vertical at the water line for small bulbs but meet it at an angle for large bulbs, then swell out continually nearly to the keel and have a wide flat at the keel level. Figs. 7 and 8 show these sections.

In other words the bulb in the experiments I am dealing with was roughly of triangular section with its base at the keel level and its apex at the load water line.

The two sets of models I am particularly concerned with were Model Tank Series 45 and 46, but for brevity we will call them here the *A* and *B* series, *A* consisting of 20 models and *B* of 23 models. Their dimensions are given in Table I for *A* models and Table II for the *B* models. As may be seen, the *A* models were of fine block coefficient 0.552 and small displacement length ratio 60. Expanded to a 400-

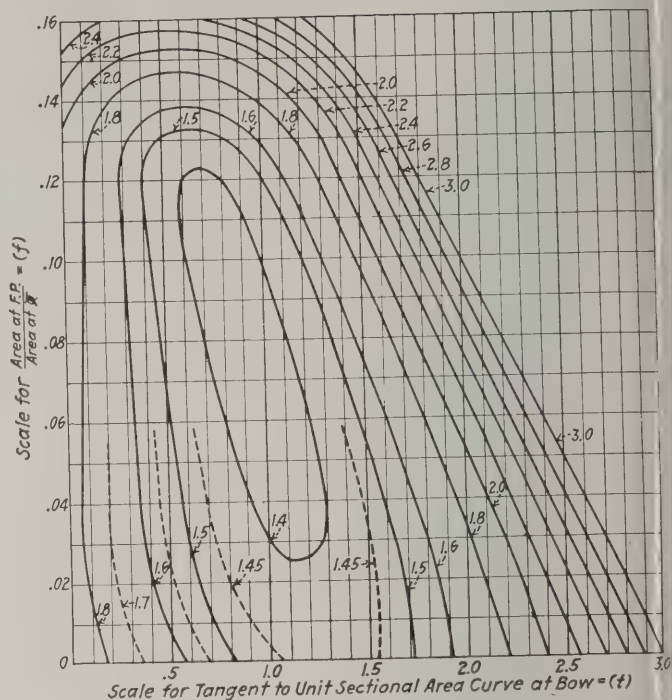


Fig. 10.—Series A. $\frac{R_r}{\Delta} = 7.0$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.783$

foot length they would have displaced 3,840 tons with beam 45.66 feet and a draft of 13.62 feet only. This shallow draft renders it harder for the bulbous bow to show its full virtue.

Models *B* of 0.6435 block and 150 displacement length ratio, if expanded to a 400 foot length, would displace 9,600 tons on a beam of 64.64 feet and a draft of 20.2 feet. The are of battleship type while the *A* models are more of the fast passenger vessel or battle cruiser type.

It will be observed in Tables I and II that the wetted surface varies with t and f . The variations are not great enough to amount to much but are shown graphically in Figs. 1 and 2 as contours of wetted surface coefficient on ordinates of f and abscissæ of t .

Space does not permit giving the lines of the 43 models but Figs. 3 to 6 give information as to their forms. Figs. 3 and 4, referring to the *A* and *B* models respectively, show the constant water lines and the constant after body curve of sectional area. In each series the changes of form were entirely forward of the midship section and below the fore body water line, being greatest near the keel. Figs. 5 and 6 show the fore body curves of sectional area of the 20 models of Series *A* and the 23 of Series *B*, grouped by f values. To avoid confusion and at the same time save space, each group of these curves is kept clear vertically of other groups by suitable shifting of scales.

VARIATION OF f AREAS

Owing to the fact that for each group there is a wide variation of t the variations in the fore parts of the sectional area curves are quite as radical as the variations of f areas. As regards these latter—the f areas—Figs. 7 and 8 show for each model of each series the constant midship section, the bulbous section at the fore perpendicular and a section halfway between the bow and the midship section. Tables I and II should be consulted in connection with Figs. 7 and 8. Scrutiny of Figs. 7 and 8 make it obvious that many of the tested were remarkable. The models themselves show to the eye the variation of t as well as of f and to the conventional eye many of them would appear truly ridiculous. It is on

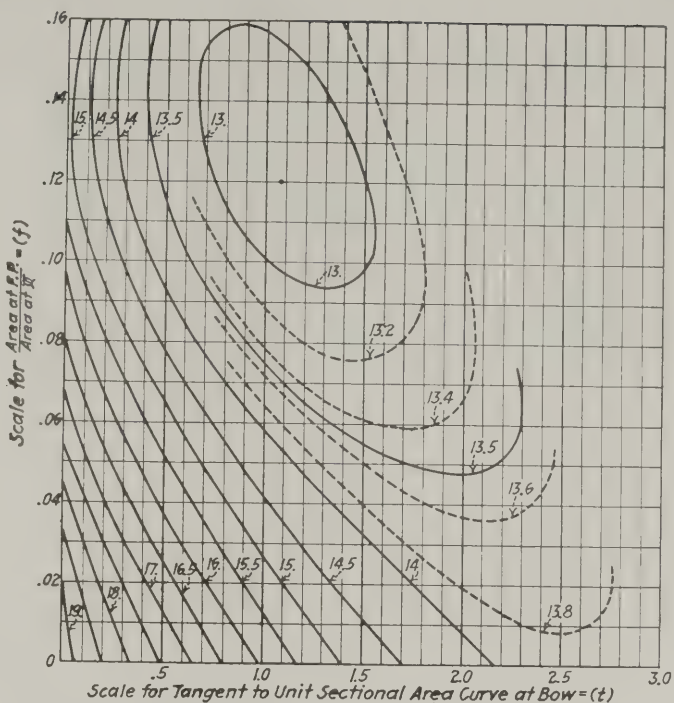


Fig. 13.—Series A. $\frac{R_r}{\Delta} = 16.1$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 1.230$

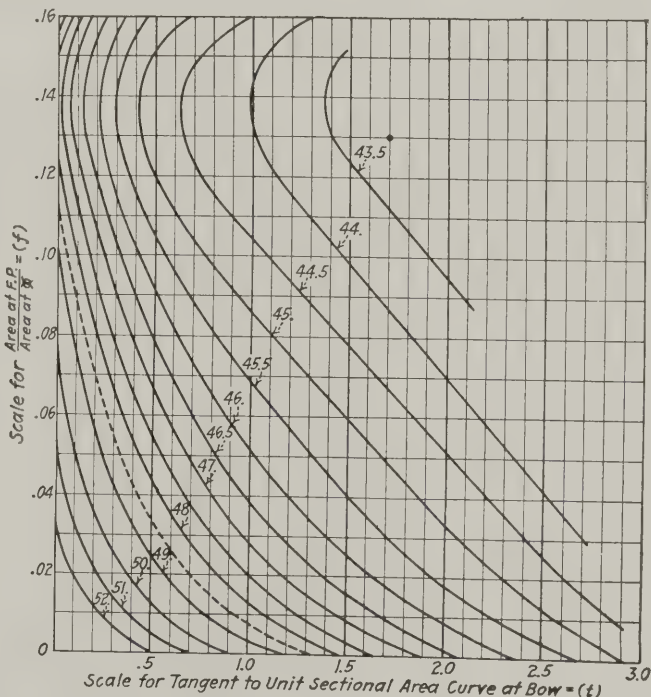


Fig. 14.—Series A. $\frac{R_f}{\Delta} = 21.7$. Contours of $\frac{R_f}{\Delta}$ for $\frac{V}{\sqrt{L}} = 1.454$

A separate set of contours was laid down for each value of $\frac{V}{\sqrt{L}}$, the usual dimensions less coefficient expressing speed, V being speed in knots and L length in feet.

At low speeds the frictional resistance is by far the major factor in the total resistance and only at very high speeds is it surpassed by the residuary. So in order to avoid forgetting this fact there is recorded upon each contour diagram a frictional resistance corresponding to the speed. Since the frictional surface varies slightly with t and f and the frictional resistance by our standard formulæ varies with length of

vessel, it is necessary to base the figures of $\frac{R_t}{\Delta}$ upon an aver-

age wetted surface and a definite length. For the *A* models the wetted surface coefficient used (see Fig. 1) was 0.3325 and for the *B* models (Fig. 2) 0.3390. The standard assumed

length was 400 feet. The values of $\frac{V}{\sqrt{L}}$ to which the several

diagrams refer do not convey much idea of actual speeds except to experts. But multiplied by 20 or $\sqrt{400}$ they become actual speeds of a 400-foot vessel. The speed of a

vessel of this length is $0.5 \times 20 = 10$ knots when $\frac{V}{\sqrt{L}}$

$= 0.5$. It is $0.8 \times 20 = 16$ when $\frac{V}{\sqrt{L}} = 0.8$ and so on.

Consider now the diagrams. Figs. 9 to 20 show contour diagrams that have been selected as typical from a larger number, Figs. 9 to 14 refer to models *A* and 15 to 20 to models *B*.

SERIES A—FINE, FAIRLY FAST VESSELS

Consider first the Series *A* figures. Fig. 9, corresponding to 11.18 knots for a 400-foot vessel, shows $f = 0.05$, $t = 1.0$ as about the best combination. Consider first, however, the case of the normal type vessel without a bulb. For this case $f = 0$. It is interesting to note in Fig. 9 that when $f = 0$ the residuary resistance varies decidedly with t , the pounds per ton ranging from the minimum of 0.45, when $t = 1.25$, to 0.6, when $t = 0$, and 1.1, when $t = 3$.

As we give f increasing values there is a falling off in t for best results. The minimum residuary is about 0.4 when $f = 0.05$. This is a 10 percent reduction from the minimum without a bulb. However, since the frictional resistance at this speed is about 3.7 pounds per ton, the gain from the bulb is only about 1 percent—a real gain but a small one.

Passing now to Figs. 10 to 14 we see that the actual residuary resistance and its relative importance increase

steadily with speed. Until $\frac{V}{\sqrt{L}} = 1$ about, corresponding

to 20 knots for a 400-foot ship, the best t keeps in the vicinity of 1. The best f increases steadily until it is over 10 percent at 20 knots. The maximum gain possible from the bulbous bow remains somewhere near 10 percent of the residuary up

to $\frac{V}{\sqrt{L}} = 1$, but at this speed it is some 3 percent of the total instead of 1 percent as at 11 knots.

Above $\frac{V}{\sqrt{L}} = 1$, in Figs. 12, 13 and 14, there is rather

a rapid change in type of the figures. In the first place for $f = 0$ the best value of t , which has been increasing slowly over that for lower speeds, increases rapidly until in

Fig. 14, when $\frac{V}{\sqrt{L}} = 1.454$, it is over 3. The best value of

f increases to 13 or 14 percent and the possible percentage of gain, from a bulbous bow, increases to over 6 percent in Fig. 14, if we hold t to the values best for speeds below

$\frac{V}{\sqrt{L}} = 1$. On the other hand, if we are bold enough to

choose t large enough, there is no gain at all from the bulb.

It is seen from Fig. 14 that for 29 knots on a 400-foot ship we would want t greater than 3. The curve of sectional areas of Model 2158 in Fig. 5 has $t = 3$ and it evidently approaches the swan form. Furthermore the bow is really of the bulbous type only the bulb does not extend to the fore perpendicular. The matter is not of practical importance for we know too much about the broad features of form to adopt

the 0.60 longitudinal coefficient of Series *A* for $\frac{V}{\sqrt{L}}$ in the

vicinity of 1.5.

TOTAL RESISTANCE REDUCED FROM 1 TO 3 PERCENT

Summing up the Series *A* results we may say that for it a properly chosen bulbous bow will save us something like 10 percent of the residuary resistance and from 1 to 3 percent of

the total for speeds up to a $\frac{V}{\sqrt{L}}$ value of unity. At higher

speeds the relative saving is less and disappears at speeds as

high as $\frac{V}{\sqrt{L}} = 1.5$, if we select t to suit the speed.

As regards t , the best value remains close to 1 until we reach a $\frac{V}{\sqrt{L}}$ value in the vicinity of unity. It then increases

rather rapidly with $\frac{V}{\sqrt{L}}$ until it reaches 3 when $\frac{V}{\sqrt{L}} = 1.25$ and increases still more for higher speeds.

Series *A* has thrown light upon a matter that had puzzled me for years. The Standard Series whose results were published in "Speed and Power of Ships" had good lines and was seldom surpassed as regards resistance by the lines of models tested in the Model Basin prepared by various naval architects. Now and then we had models that beat it at

some speeds but at about $\frac{V}{\sqrt{L}} = 1$, the Standard Series

seemed unbeatable. I feared that we had fared into the Standard Series results at about that speed something that did not exist; but bearing in mind that the Standard Series had a bulbous bow—though not a very large bulb—it is now evident that it thereby had a handicap in its favor at the very speeds where it seemed unbeatable.

SERIES B—RATHER FULL, MODERATE SPEED VESSELS

Let us now consider Series *B*—Figs. 15 to 20. Here we are dealing with a fat full-bodied vessel and there is no

use pushing our results much beyond $\frac{V}{\sqrt{L}} = 0.9$.

One thing that strikes us at once is that at low and moderate speeds the best value of t is not about unity but about zero.

While this may seem strange at first sight it is quite in accordance with many model tests of moderate speed vessels. Of course it is well known that for high speed vessels we

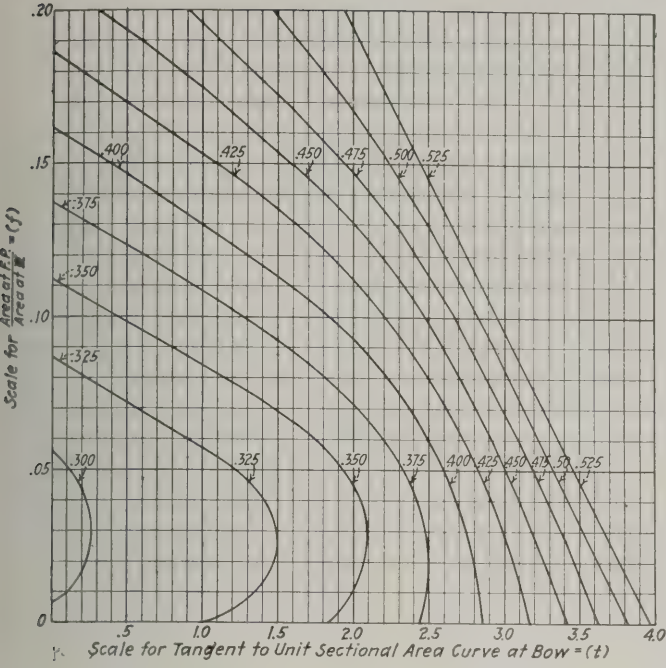


Fig. 15.—Series B. $\frac{R_r}{\Delta} = 1.6$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.447$

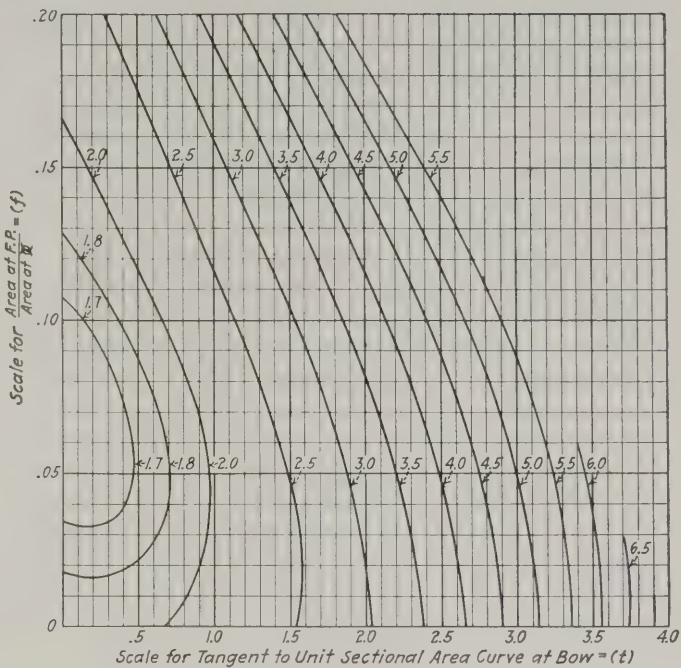


Fig. 17.—Series B. $\frac{R_r}{\Delta} = 4.7$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.805$

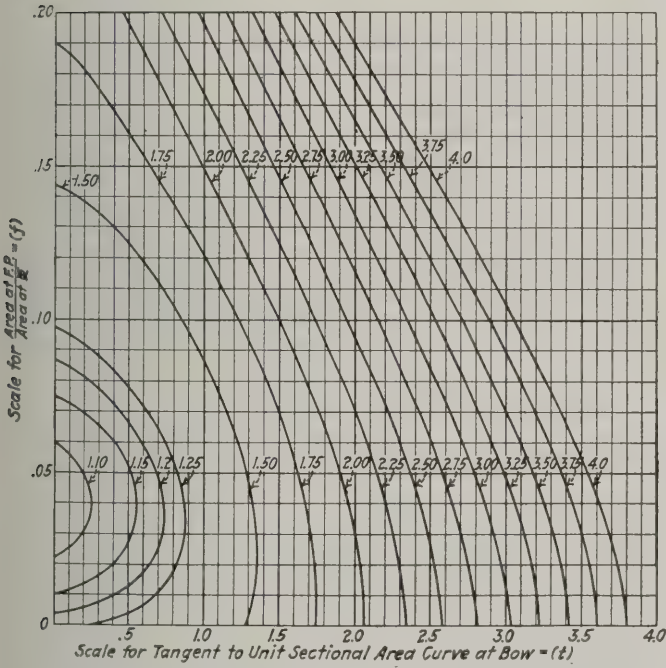


Fig. 16.—Series B. $\frac{R_r}{\Delta} = 3.9$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.715$

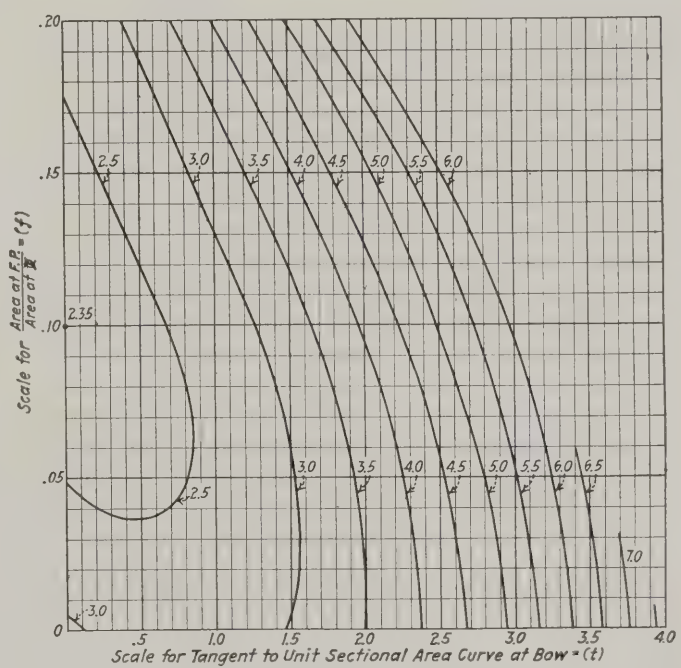


Fig. 18.—Series B. $\frac{R_r}{\Delta} = 5.3$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.850$

need large longitudinal coefficients which are associated with full ends and for low speed vessels small longitudinal coefficients with their resulting fine ends are the best. It almost seems from the A and B models that when we attempt to differentiate further for moderate speed vessels we should adopt as our slogan—"The Fuller the Body, the Finer the Bow."

THE FULLER THE BODY, THE FINER THE BOW

It will be observed in fact that for Series B the contours indicate minimum residuary at some speeds for negative values of *t*. Of course where *f* has a value, negative values of

t are physically possible as in Model 2416, but I will not undertake to pursue *t* below zero.

The table below summarizes Figs. 15 to 20.

Figure Number	15	16	17	18	19	20
$V/\sqrt{L}$	.447	.715	.805	.850	.894	.939
Corresponding speed for 400-foot vessel	8.94	14.30	16.10	17.00	17.88	18.78
Best value of <i>t</i> where <i>f</i> = 0	0	0	0.35	0.75	1.10	1.50
Best value of <i>f</i>	.03	.04	.07	.10	.13	.17
Corresponding value of <i>t</i>	0	0	0	0	.5	.5
Percent residuary resistance that can be saved by bulb	..	13	13	16	25	33
Percent total resistance that can be saved by bulb	..	3	3	6	13	18

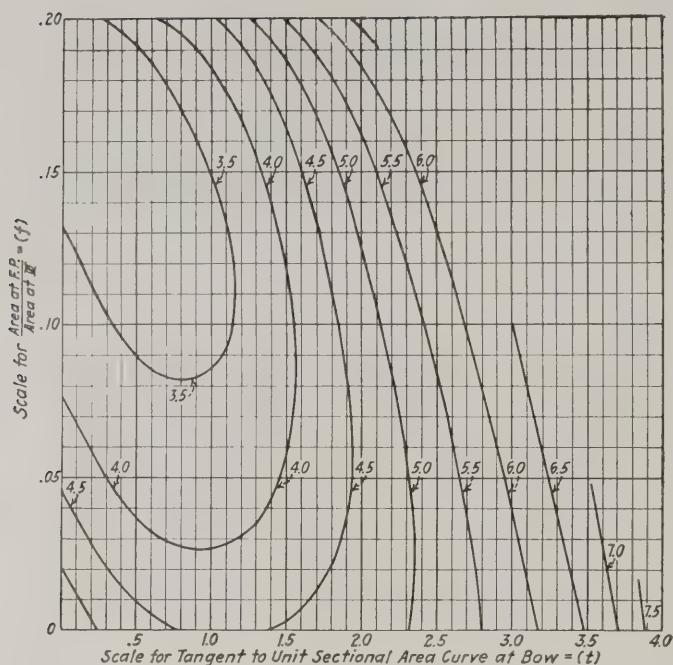


Fig. 19.—Series B. $\frac{R_r}{\Delta} = 5.7$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.894$

Without attempting to draw too many conclusions from two series of experiments, it would seem evident that there are conditions where the bulbous bow is desirable from the point of view of resistance. Even if we do not take a chance with the f value needed to make the maximum saving, there are speeds where a much smaller bulb will be distinctly worth while.

In practice, a flat bottomed bulb would give trouble by pounding in a rough sea but a flat bottomed bulb is not necessary.

I have heard no complaints of pounding of the bulbous bows actually fitted on our battleships. The ingenious naval

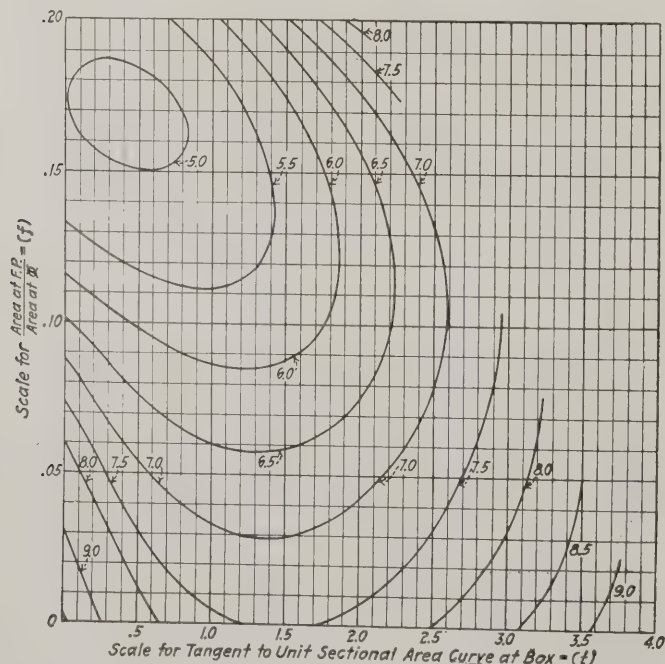


Fig. 20.—Series B. $\frac{R_r}{\Delta} = 6.3$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.939$

architect will have no difficulty in devising bulbous forms where little or no furnacing of the structural plating is necessary.

EFFECT OF BULBOUS BOW ON OTHER TYPES OF VESSELS

In conclusion I may point out that Series A and B deal with two important types, the fine fairly fast vessel and the rather full moderate speed vessel. There are two other broad types of interest, the very full low speed vessel and the full very fast vessel such as a destroyer.

As regards the former the effect of the bulbous bow has not been investigated at the Model Basin. Such vessels generally have in service such extreme variation of draft forward that for them the bulbous bow would be a dubious proposition to say nothing of the fact that their speeds are generally below those for which from experiments to date the bulbous bow is indicated.

A series has been recently tested of the long full ended slab sides destroyer type and the savings by the bulbous bow seem decidedly less than for Series A and B. The results are of little interest to the mercantile shipbuilder while the results of A and B are not only of general interest but liable to have a direct dollars and cents bearing upon some problems of mercantile shipbuilding.

MONTHLY SHIPBUILDING REPORT.—The Bureau of Navigation, Department of Commerce, reports 116 sailing, steam, gas and unrigged vessels of 9,760 gross tons built in the United States and officially numbered during the month of July.



Powerful Sperry Searchlight Mounted on Foremast of the Leviathan

This 36-inch searchlight is the most powerful aboard any merchant vessel, and gives a 450,000,000 candle power beam. Reports from the trial trip of the "Leviathan" advise that an object was seen twenty-one miles by this searchlight, which, incidentally, is the same powerful type searchlight that was seen by the U. S. Army Aviators Kelly and Macready fifty miles from Bellville.

Details of Isherwood Design for Welded Ship—Process of Erection—The Caldwell All-Electrically Welded Barge

THE success obtained by the electric arc welding process urged men of initiative on to greater accomplishments, and Mr. A. J. Mason, while associated with the United States Shipping Board during the war period, proposed using a large electric spot welder in place of riveting for holding various members together, finishing the joints with electric arc welding in place of calking. This suggestion was approved by the United States Shipping Board to the extent that a 42 foot sample section of a 9,600 ton ship was ordered constructed. However, the signing of the Armistice caused

this work to be suspended, which is much to be regretted. "Had this experiment been carried to conclusion, it would have demonstrated a great saving in hull construction," Captain J. Caldwell, managing director of the Alloy Welding Processes, Ltd., remarked, in his report to the Emergency Fleet Corporation.

Upper Deck Stringer Longl. 1.00" for $\frac{1}{2}$ L
to .56" at Ends Outside Bridge

Bridge Beams: 10"x3.4"x.40"x22.6 Lb. C
Half " 8"x3.41"x.41"x21.5 Lb. C

Bridge Frames 6"x3 $\frac{1}{2}$ "x.35"x15 Lb. C
Spaced 36"

Bridge Side Plating
Horiz. .66" Throughout

Upper Deck Plating Trivse
.44" for $\frac{1}{2}$ L Outside Bridge to
.38" in Bridge at Ends .34"

Upper Deck Beams:-
Through Beams 10"x3.4"x.40"x22.6 Lb. C
Half " 8"x3.41"x.41"x21.5 Lb. C

Note: Two rows of Pillars

2nd. Deck Plating-Transverse
0.33" for $\frac{1}{2}$ L to .31" at Ends

Sheer Strake Longl.
1 $\frac{1}{2}$ " for $\frac{1}{2}$ L at Breaks 1 $\frac{1}{2}$ "
.66" in Bridge .56" at Ends

Intercostal Strap 3"x.75"
Intercostal Strap 3"x.53"
Continuous 1"sq

2nd. Deck Beams:
Through Beams 10"x3.475"x.475"x26.4"
Half " 10"x3.4"x.40"x22.6"

Frames:-
12"x3 $\frac{1}{2}$ "x32 Lb. C for $\frac{3}{8}$ L Spaced 36"
10"x3.75"x30 Lb. C Outside $\frac{3}{8}$ L to Peak Bkds.
Spaced Fwd. of $\frac{3}{8}$ L 27". Aft of $\frac{3}{8}$ L 33" and 30"
6"x3 $\frac{1}{2}$ "x $\frac{3}{8}$ L in Peaks, with 3 $\frac{1}{2}$ "x3 $\frac{1}{2}$ "x $\frac{3}{8}$ L
Reverse Frames, Spaced 24". Depth of Frame 6 $\frac{1}{2}$ "

Side Girders Intercostal Between Solid Floors:-
.40" for $\frac{1}{2}$ L. .36" at Ends .50" in Boiler Room
Tank Top C.L. Rider Plate Longl.:-
 $\frac{5}{8}$ " for $\frac{1}{2}$ L. $\frac{5}{8}$ " in Boiler Room .50" at Ends
Center Vertical Keel Longl.:-
.56" for $\frac{1}{2}$ L. .60" in Boiler Room .50" at Ends
Tank Top Plating Transverse:-
.44" for $\frac{1}{2}$ L. .50" in Boiler Room .38" at Ends
Outside Keel Strake Longl. 1 $\frac{1}{2}$ " for $\frac{3}{8}$ L. .80" at Ends
Bottom Plating Transverse:-
.56" for $\frac{1}{2}$ L Forward .48" Aft

Skeleton Floors on every Alternate Frame
for $\frac{3}{8}$ L except in E. and B. Room

3 $\frac{1}{2}$ " Flange
3 $\frac{1}{2}$ "x3 $\frac{1}{2}$ "x.44"

Floor Continuous from Vert. Heel to Margin Plate:-
.44" for $\frac{1}{2}$ L. .54" in Boiler Room .38" at Ends
Solid Floors on every alternate frame from
 $\frac{3}{8}$ L on every frame in E. and B. room and
outside $\frac{3}{8}$ L

Side Plating Vertical
between Bilge and
Sheer Strakes .53"
.53" for $\frac{1}{2}$ L. .46" at Ends

Continuous Strap
3 $\frac{1}{2}$ "x3 $\frac{1}{2}$ "x.44"
Every Frame

Bilge Plating Longl.
.66" for $\frac{1}{2}$ L. .53" at Ends

549

Fig. 67.—Profile and Upper Deck Plans, Isherwood Design for Welded Ship

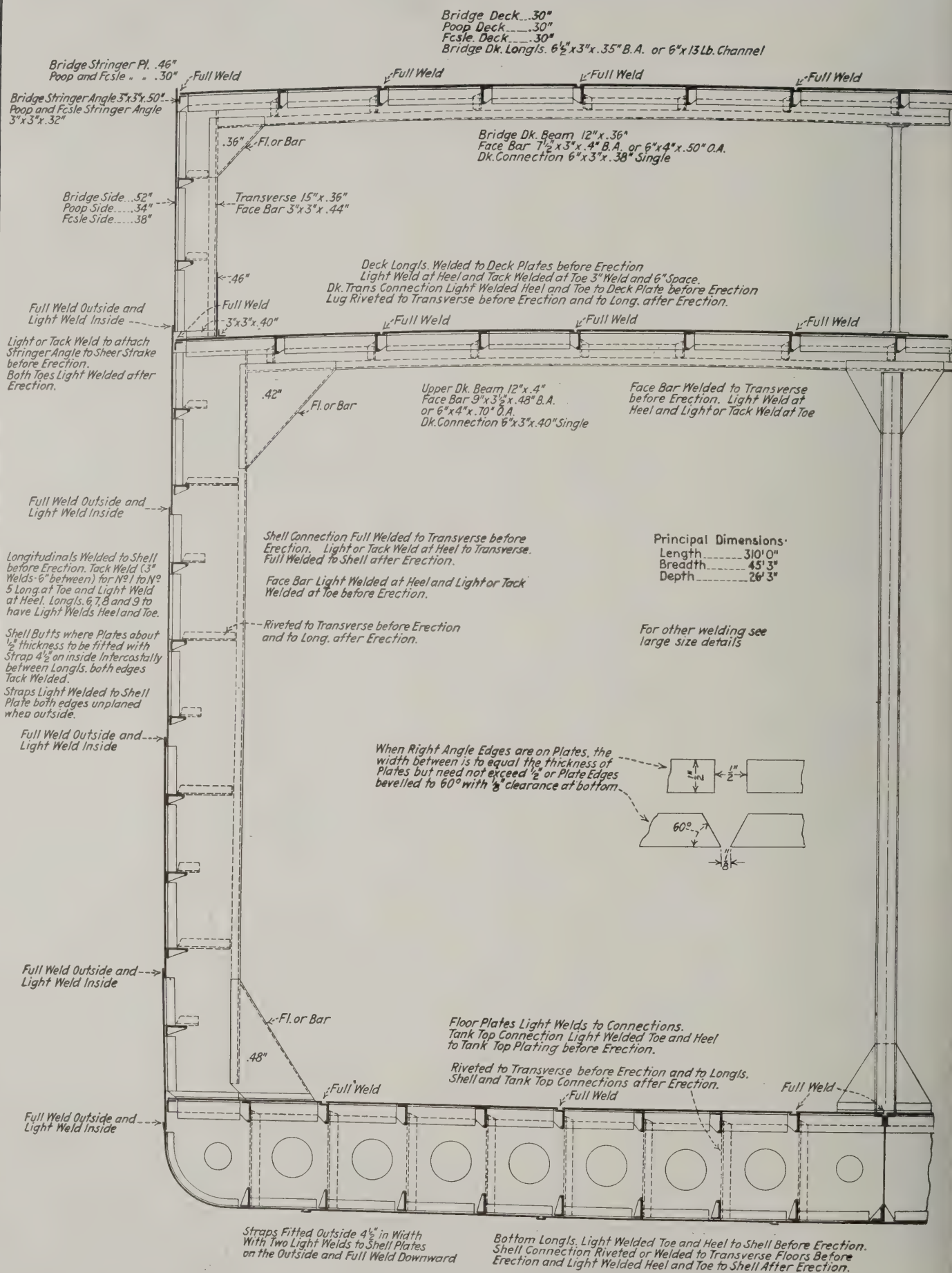


Fig. 68.—Midship Section, Isherwood Design for Welded Ship

and all parts ready for final welding. I wish to draw attention to the very small amount of welding to be done on the ship after erection.

Full welds of double bottom for: Butt seams, butt straps and butts of longitudinals, connection of center keelson plate top and bottom.

Light welds of double bottom for: One edge of outside seam strap, top and bottom of floor plates and transverse clips.

If the service bolt holes in the seams and butts are fitted with plugs and welded and the small connections at the intersection of the longitudinals with the floor plates are

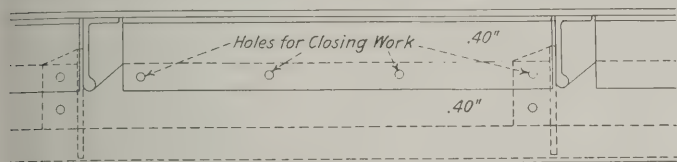


Fig. 69.—Upper Deck Transverse Beam, Isherwood Design for Welded Ship

welded, then all riveting in the double bottom of the ship is obviated. It is assumed that the service bolt holes for the work done in the shop and on ground were filled up before material was brought to the ship and before erection.

Full welds of side plating and internal work: outside edges of shell overlaps, butts of shell plates and longitudinals, connection of transverse plates to shell clips and inner bottom plating.

Light welds of side plating only for inside edges of shell overlaps.

Full welds are used for seams of deck plating, butts of deck plating and longitudinals, heel of gunwale bar and connections of beams to transverse framing.

Light welds for connection of transverse beam plates to slips already on deck and for pillar and detail work.

Mr. H. Jasper Cox, in his paper read before the Society of Naval Architects and Marine Engineers, comments on the Isherwood design of welded ship, as follows:

"The system of construction lends itself to a large proportion of the total welding being done prior to erection, and in working out the details, no attempt has been made towards an unreasonable amount of elimination of bolting or riveting. For instance, the longitudinals are attached to

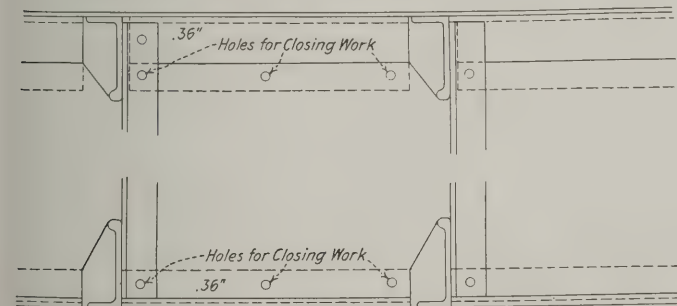


Fig. 70.—Transverse Floor at Shell and Tank Top, Isherwood Design for Welded Ship

the shell plating by service bolts spaced 12 inches apart and are welded at the toe and heel by continuous light welds; then the bolts are removed and rivets or welded studs fitted. In other parts, where the minimum number of bolts necessary to properly tighten up the work approaches the total number of rivets required in a riveted ship, the designer has simply added the extra rivets instead of attempting to weld."

Further details of construction can be found by studying the accompanying plans kindly furnished me by Sir J. W. Isherwood.

THE CALDWELL ALL ELECTRICALLY WELDED BARGE

Major James Caldwell, managing director of the Alloy Welding Processes, Ltd., London, has prepared a design for an all electric arc welded barge using the conventional transverse frame ship design with certain modifications in details of construction. This design is based on the experience gained from the building at Richborough Dockyard of the barge previously described and known as the AC-1320.

The principal dimensions of Major Caldwell's barge are

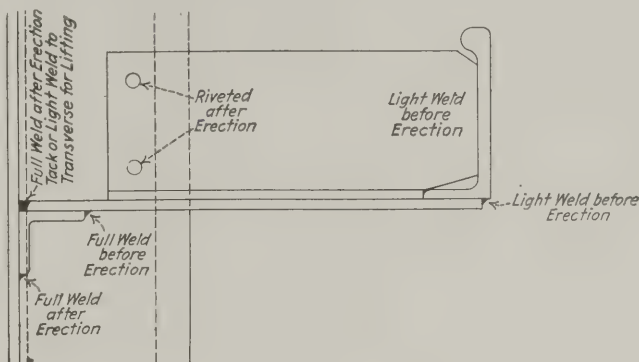


Fig. 71.—Section Through Side Stringer, Isherwood Design for Welded Ship

length between perpendiculars 125 feet 3 inches, molded breadth 16 feet 5 inches, molded depth 8 feet 6 inches. Displacement at 5 feet 3 inches draft is 280 tons and on 6 feet 0 inch draft 320 tons. The propelling machinery is an 80 horsepower, 2 cylinder, 4 stroke oil engine, weighing 5 tons. Total weight of the barge is estimated at 80 tons.

Major Caldwell states that the principles governing the substitution of arc welding for riveting in the construction of a ship are as follows:

1. Obtaining equivalent strength.
2. Minimum of overhead welding.
3. Ease of repair.

In commenting on these three basic principles of design,

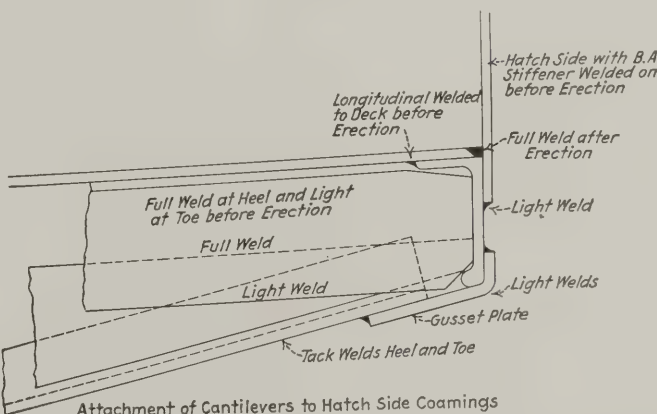


Fig. 72.—Attachment of Cantilevers to Hatch Side Coamings, Isherwood Design for Welded Ship

he states: "Tensile and alternating stress tests repeatedly carried out during the last twelve months on ship plates welded with covered electrodes have shown that compared to equivalent riveted joints, the arc welded joint is consistently superior in ultimate strength, and is, moreover, water and air tight up to its breaking point, whereas a riveted and calked joint fails in watertightness at 10 percent of its breaking load. It is sufficient for the purpose of this report to state that in plates up to $\frac{3}{8}$ inch thickness a continuously welded lap joint is about 100 percent stronger in tensile strength

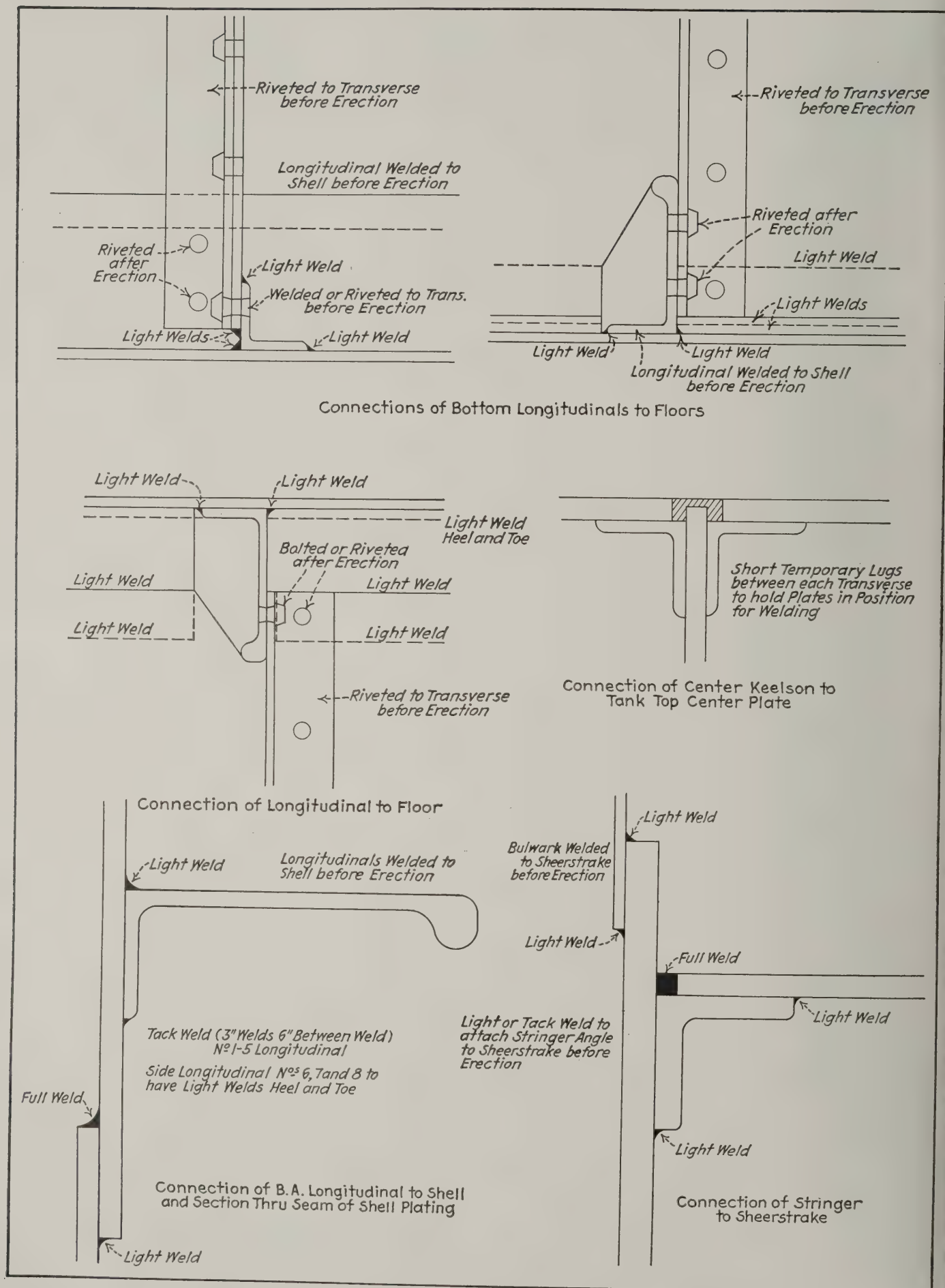


Fig. 73.—Details of Construction, Isherwood Design for Welded Ship

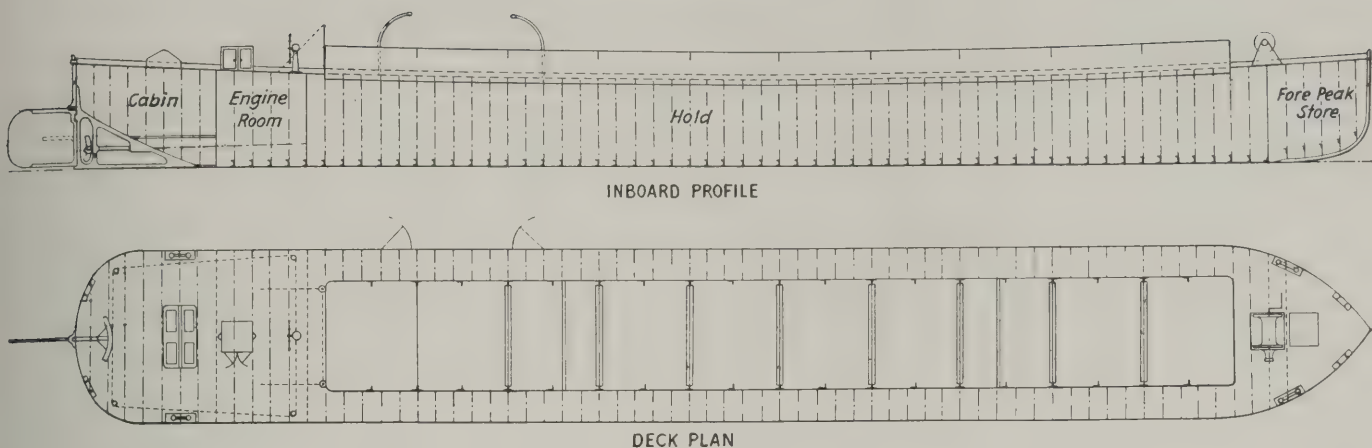


Fig. 74.—Profile and Deck Plan, Caldwell Arc Welded Barge

than a standard riveted lap joint and it is estimated that in no part of the design are the welded joints less than 50 per cent stronger than the equivalent riveted joint.

OVERHEAD WELDING

Welding in an overhead position increases labor cost owing to the slower speed obtainable and the tiring of the operators. Reliable welds can be made in this position where the necessary headroom is available, but in cramped positions it is difficult. For economical reasons it should be avoided where possible. Careful attention has been given to this point in this design and overhead welding is avoided to a considerable extent by suitable arrangements of the joints

with engineers of extensive experience in ship repair the relative merits of welding and riveting for the general attachment of plating to frames and floors. As a result, it has been decided that the advantage of welding considerably outweighs the risk I have mentioned which should not occur unless unskilled labor is utilized. As a further precaution, I suggest the introduction of "attachment" strips between frames and plating, which would bear the whole force of possible damage when plates were cut away and replaced by new plating welded to the hull. However, as a result of experience, should it be found preferable for this work to be riveted this method could be adopted without alteration of design.

The superiority of continuous welded joints over equivalent riveted joints in both tensile and shear stresses is so marked that considerable economy in the amount of welding has been obtained by substituting "tack" welding (spaced welds of short lengths) for continuous welding wherever possible without sacrificing the factor of safety in any way. On shell, bottom and deck plating, and watertight bulkheads, continuous welding is adopted to ensure watertightness. For the shell seams the plates are joggled with continuous welds on both edges. For the vertical joints, butt straps are used of light section with continuous butt weld between plates and tack welded between straps and plates.

In general, all watertight work is continuously welded, and non-watertight work tack welded.

In connection with erection the assembly of fabricated sections of the barge on the ground for subsequent erection on the ship has such manifest advantages in enabling the welding to be carried out in the easiest position thereby reducing overhead welding and facilitating inspection that it should be adopted to the greatest possible extent.

Welded construction adapts itself well to such fabrication as well as the use of jigs and templates for rapid production of repetition work such as frames, floors, bulkheads, etc.

SCHEME OF FABRICATION

The following scheme of fabrication is estimated to facilitate welding operations and decrease labor cost.

Frames, floors, frame beam and bracket knee and center keelson lugs to be tack welded in the field and erected in one piece.

Deck plating in way of hatches to have half beams, gunwale bar, deck coaming bar and alternate butt straps welded in the field and erected in sections.

Hatch coaming plates to be erected with stiffeners, beam lugs, hatch cleats, molding and hatch cover rest bars all welded.

Side shells to have seams with a continuous fillet weld out-

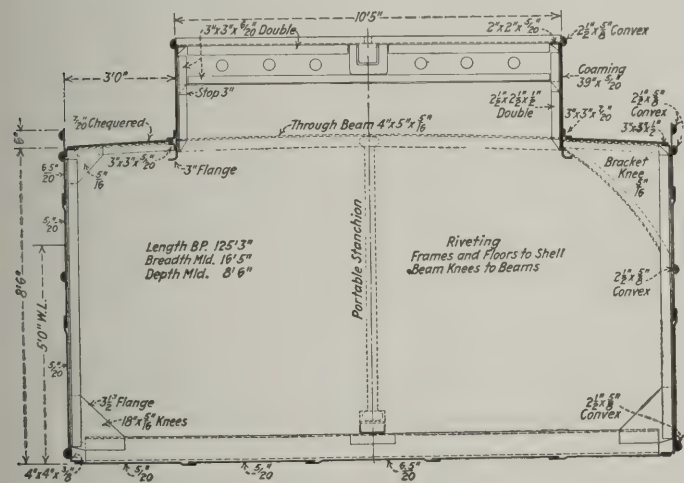


Fig. 75.—Midship Section, Caldwell Arc Welded Barge

and the adoption of a carefully planned system of fabrication of sections before erection. When overhead welding is unavoidable, plenty of headroom is available and the weld is in an easily accessible position.

Before adopting an all welded design of construction careful consideration was given to the question of probable repairs arising from the usual risk of collision and going ashore.

No difficulty is foreseen in cutting out damaged and holed plating with welded laps either by pneumatic tools, oxy-acetylene blow pipe or cutting arc, and the replacement of such plates by welding would be a very simple and satisfactory job. The removal of plates welded to frames and floors is not such a simple matter and there is risk of damage to such frames and floors during the operation of cutting out. I have, therefore, very carefully considered and discussed

side and continuous light weld inside but moldings and alternate butt straps should be welded onto the plates before erection.

Bottom shell laps to have continuous strength weld inside and light weld on outside.

All shell plates butt welded on ship with inside strap tack welded on outside.

The calculated total welding on this vessel is equal to 9,000 feet of continuous welding on 5/16 inch plating. Of this amount 4,000 feet can be performed in the field under the best conditions leaving 5,000 feet to be carried out in position on the ship after erection.

The regulations governing welded ship construction as laid down by Lloyd's Register of Shipping provide for efficient supervision of welders, and maximum and minimum current densities in the electrode.

Minimum throat thickness of fillet welds, etc., are also insisted upon and are easily checked.

THE PARAFFIN TEST

Further it is proposed to use the paraffin injection test on watertight joints. This test which consists of projecting paraffin against the line of welding with a syringe has already proved an exceedingly useful and efficient method of detecting porous and unsound welds in the construction of welded tanks, etc.

This barge design was worked out by Mr. G. Rowell, naval architect, employed at the Richborough Dockyard during the building of the Barge AC-1320.

Accompanying copies of plans of Major Caldwell's barge will furnish further detail information.

(To be continued)

Mechanical Oil Burner Designed with Self-Contained Forced Draft

THE latest type of mechanical atomizing oil burner, the Mayflower design, developed by the Babcock and Wilcox Company, New York, incorporates a self-contained forced draft system.

The burner consists of the main casting with a bladed cone, to which a hollow shaft turbo blower is attached. The atomizer fits through the blower shaft and may be moved in and out by the adjustment of coupling studs. A quick detachable

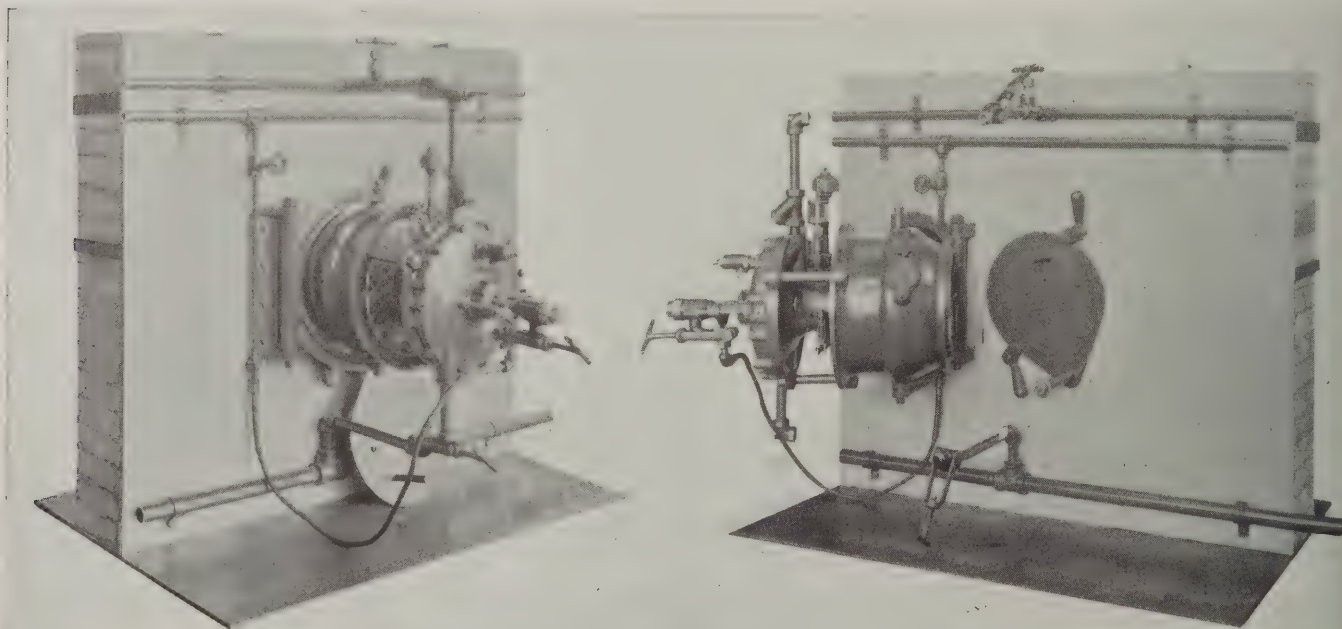
yoke and coupling, similar to that used on other Babcock and Wilcox types of burners is also fitted to the atomizer. An impeller blade is fastened to the bladed cone by means of lugs. Access may be gained to the furnace by swinging aside the burner which is hinged. This also provides for the insertion of a fire tile plug which is put in place when the burner is not in use. Steam connections to the turbine are detachable and somewhat similar to the quick detachable yoke and coupling used on the oil burner connection.

The special advantages claimed for the burner are that on forced draft work it eliminates all ducts as well as the large blowers supplying air to the ducts; further, any number of burners can be run independently without having air leakage through dead burners, as is sometimes found when double front construction is used. As the air for combustion can be regulated very closely to the required amount, owing to the multiplicity of speeds available with the turbo blower, higher efficiency can be obtained.

When installing these burners, the steam piping can be so arranged that one master valve on the steam supply to the turbines regulates the air supply to all burners in operation with but a single adjustment. The oil supply to all burners can also be regulated by a master valve located adjacent to the steam master valve. By this method, one man can control any number of units obtaining the correct combustion with the minimum amount of work.

This type of burner has been thoroughly tested by the United States Navy at the fuel oil testing plant of the Philadelphia Navy Yard and found satisfactory.

S. S. CLEVELAND TO BE CABIN SHIP.—The steamship *Cleveland*, recently acquired by the United American Lines, is at the Blohm and Voss shipyard at Hamburg, Germany, where she is being reconditioned and converted to an oil burner prior to entering regular service as a cabin ship. Her first and second class accommodations are being combined into a single cabin class. When the work is completed the vessel will accommodate approximately 500 cabin class passengers and 700 third class passengers in rooms. Captain E. C. Tobey, vice-president in charge of operations for the United American Lines, is in personal charge of the reconditioning of the ship. The *Cleveland* will take up regular sailings between New York, Cherbourg, Southampton and Hamburg this fall.



Mayflower Burner in Operating Position with Steam and Oil Lines Connected (left); with Burner Swung Away from Front for Inspection (right.)

Turbine Electric and Geared Turbine Drive

All Factors Affecting a Particular Ship Should Be Considered Before Selecting Type of Propelling Machinery

By W. C. Watson and John Thomas*

AFTER reading Mr. Shaw's article headed "An Analysis of the Claims of the Electric Drive over the Geared Drive," which appeared in the July issue of *MARINE ENGINEERING AND SHIPPING AGE*, a few readers of this magazine no doubt have gained the impression that the General Electric Company is advocating turbine electric drive for all types and sizes of steamships. It appears that Mr. Shaw has misunderstood the purpose of our article headed "How to Get a Shaft Horsepower Hour for All Purposes with Steam on from 0.75 to 1.00 Pound of Oil," which appeared in the May issue of *MARINE ENGINEERING AND SHIPPING AGE*, and was written to inform the marine fraternity of the possibilities to be obtained through the use of turbine electric form of propulsion.

Mr. Shaw has made the statement that the article was conspicuous due to absence of detail data to substantiate the claims made for this form of propulsion. However, the data have been thoroughly discussed and approved by reliable shipbuilders and ship operators in this country and abroad, and we would be pleased to forward copies of the detail calculations to any interested parties, as they were purposely left out of the article on account of the mass of detail involved.

MANUFACTURES THREE TYPES OF SHIP MACHINERY

The General Electric Company is engaged in the study and manufacture of Diesel electric, turbine electric and geared turbine propulsion machinery for ships, and is attempting to determine the proper installation for each particular ship.

DIESEL ELECTRIC DRIVE

A number of vessels have been equipped with Diesel electric propulsion apparatus, trial results of which indicate that the future for this type of drive is very promising. Further discussions will appear in later publications.

GEARED TURBINE DRIVE

The General Electric Company has been engaged in the design and manufacture of marine geared turbines for eight years, and has built over 2,000,000 horsepower of which approximately 1,300,000 horsepower has been installed in destroyers and is of the single reduction type corresponding to 1,000,000 horsepower manufactured by the William Cramp and Sons Ship and Engine Building Company as referred to by Mr. Shaw. While these reduction gears furnished by both companies have given no trouble, all marine engineers appreciate that equipments of this type are only suitable for vessels where full power is seldom employed, and are not suitable for cargo and passenger ships when efficient propeller speeds are employed. In addition to these single reduction gear equipments, the General Electric Company has equipped 322 merchant ships involving approximately 800,000 horsepower of the double reduction type. While 12 of these vessels were sunk during the war and 34 have had machinery replacements, the average mileage steamed by the remaining 288 vessels is approximately 93,000 miles each, and today about 200 of the geared turbine vessels in actual operation under the American flag are equipped with General Electric Company double reduction geared turbine machinery. Ninety-eight of these vessels have steamed an average of 120,000 miles each without gear replacements.

Although thoroughly reliable double reduction geared turbine equipment can now be obtained for cargo vessels requiring from 2,000 horsepower to 4,000 horsepower per propeller shaft, no marine engineer should attempt to specify one type of propelling machinery for all steamships. Turning to larger passenger and cargo vessels, our experience and knowledge of the problems encountered lead us to believe that a greater degree of success can be encountered with the turbine electric drive than with any other form of propulsion. There are certain cases in the smaller powered steamships where flexibility of control and other considerations influence the marine engineer in favor of turbine electric drive.

TURBINE ELECTRIC DRIVE

The problem of comparing the results of two vessels equipped with different types of propelling machinery is extremely difficult, even when the vessels are of the same type. Mr. Shaw has presented certain curves to prove superiority of geared turbines over turbine electric propulsion, and in so doing has compared a 32,000-ton displacement, 28,000-shaft horsepower, 21-knot battleship with a 7,600-ton displacement, 90,000-shaft horsepower, 35-knot light cruiser. It would appear to us that it would be just as practical to compare the performance of the 1,800-horsepower 71-knot motorboat *Miss America 2nd* with the 4,200-intermediate horsepower 11½-knot motorship *William Penn*.

In either case the boats are of entirely different types and designed for entirely different service, and the machinery for one would be unsuitable for the other without extensive alterations, which would materially change the results. Furthermore, the electric drive battleships have four screws instead of two, as mentioned by Mr. Shaw. We believe that a comparison of electric drive battleships with the only geared turbine battleship in the U. S. Navy, the *North Dakota*, would have been more valuable to readers of *MARINE ENGINEERING AND SHIPPING AGE*, but while the electric driven vessels show a marked improvement in fuel consumption over this battleship, we will not include a comparison as the *North Dakota* has certain machinery details which might make a comparison misleading.

EFFICIENCY AT CRUISING SPEEDS

Mr. Shaw has made the claim that the geared turbine machinery is far superior to turbine electric drive at cruising speeds, and while marine engineers appreciate that geared turbine installations can be designed for as efficient operation as electric drive at a definite speed, all fair comparisons have shown that the turbine electric drive is superior at reduced power when more than one turbine generating set is employed. This has again been confirmed by recent studies of electric drive for naval vessels for various navies of the world. At several different speeds it is possible with the electric drive to shut down all but one main generating unit and turn all propellers with this one unit and to maintain at least half speed of the vessel. Pole changing propulsion motors are usually installed in such ships, which enable the operator to run the one main generating unit at efficient speeds during cruising operation of the ship. On the other hand, with the geared turbine installation it is necessary to operate practically all of the engine room machinery at cruising speeds, which also makes it difficult to make repairs to most of the machinery while the ship is under way.

* Marine department, General Electric Company, Schenectady, N. Y.

FUEL CONSUMPTION

There has been considerable discussion concerning the fuel consumption of the five turbine electric driven vessels of the *Eclipse* type, and Mr. Shaw included a few figures on their operation. During the war there came a time when the mechanical drive facilities of the country were fully employed. Since the building of engines was the limiting feature of the shipbuilding program, the Emergency Fleet Corporation turned to turbine electric drive as a way of increasing the output of propulsion machinery. The five electric ships of the *Eclipse* type were the only cargo boats equipped with the turbine electric drive as a result of that program. The propulsion turbines, generators and motors installed in these vessels were accurately tested at the factory at the time of manufacture, where the most refined measuring apparatus was employed and there is no doubt as to actual steam consumption of these units. No material improvement in fuel consumption over that of good geared turbine installations could be expected, and the ships have been studied by the advocates of electric drive primarily from the viewpoints of reliability and low cost of upkeep. The same boilers, which were not the most suitable for superheaters, and the original auxiliaries were maintained at the time the geared turbines were removed to permit installation of electric drive.

FIRST ELECTRIC DRIVE CARGO BOATS

It should be recognized that these were the first electric drive cargo boats in this country, and while they are not well balanced installations and do not represent what can be done today, the average fuel consumption of the *Archer* is approximately 1.16 pounds of oil per shaft horsepower hour for all purposes, as mentioned by Mr. Shaw, which is as good as the average geared installation and all that one could expect on this particular ship. The performance of these five cargo boats, as well as the performance of naval vessels and the four Coast Guard cutters of the *Tampa* type, has demonstrated without question the reliability of the turbine electric propulsion machinery, and has also established the fact that the maintenance expense is less than for any other form of ship drive. The turbine electric drive has proven itself extremely popular with the crews, and chief engineers have made the statement that they consider it easier to go to sea with a green crew on an electric ship than with any other form of propulsion.

The possibility of short circuits in the electrical machinery is very remote, and if they do occur, are not liable to disable the vessel. All live parts are well protected and contact with them is very difficult unless purposely done. The selection of the induction or synchronous type of propulsion motor depends entirely upon the application, and Mr. Shaw's statements concerning these types of motors are somewhat misleading. No attempt has been made by electrical experts to establish the synchronous motor as the most suitable for all propulsion applications.

No serious concern has been exercised over the smaller air gap of the induction motor, as experience over a period of ten years has shown that the induction motor is entirely suitable for such work. Both induction and synchronous motors have advantages for marine propulsion. The synchronous motor now offered by the General Electric Company primarily for the propulsion of single speed vessels might better be called a synchronous induction motor, as it combines the essential characteristics of each type. It is maneuvered as an induction motor and is operated as a synchronous motor at unity power factor only for steady running ahead or astern. Furthermore, this motor can be operated continuously at approximately half speed as a squirrel cage induction motor.

EITHER TYPE OF MOTOR EFFICIENT

Based on the performance of six ships equipped with the synchronous motor drive and a number provided with induc-

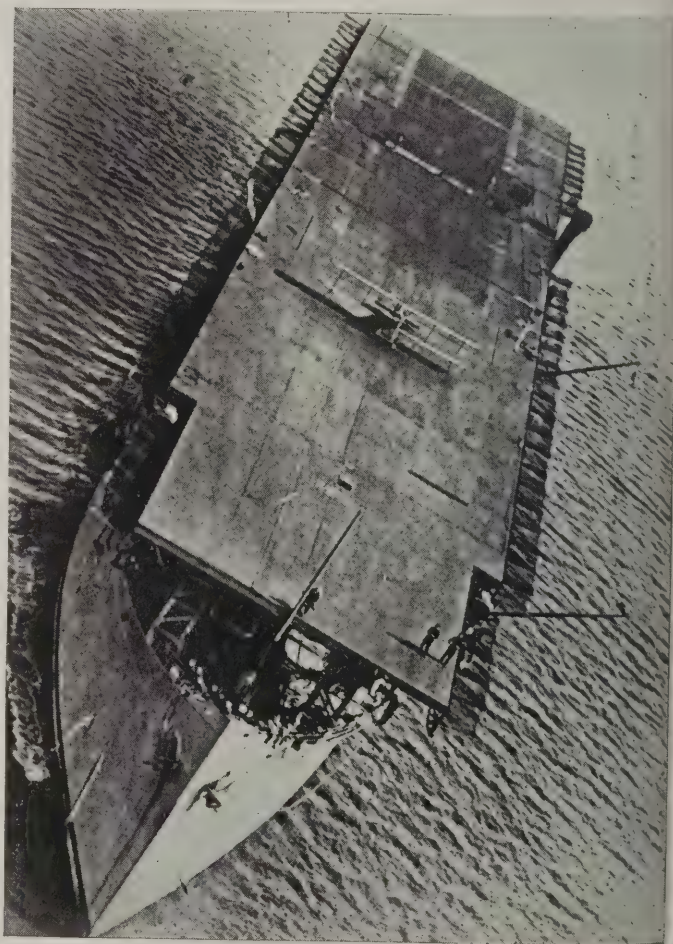
tion motors, there is no pronounced tendency for either type of motor to fall out of step under any conditions encountered at sea. The accessibility of parts for any repairs that have to be made is the principal advantage of the synchronous over the induction motor, but there is also some saving in weight and a slight advantage as regards efficiency.

In conclusion we wish again to point out that no type of drive can be recommended for a particular ship until all factors have been considered, and no single type of drive can be recommended for all seagoing vessels.

Steamer Wrongfully Libeled

THE plaintiff libeled the *Consuelo*, a Spanish steamship of steel construction, and caused an attachment to be issued against the ship, as a result of which she was arrested and taken into possession by the marshal and held, but was later voluntarily released when the plaintiff learned that their claim was against a French vessel of wood construction which bore the same name. The Court in *Artinano vs. W. R. Grace & Company*, American Maritime Cases Vol. 1, page 546, said that in an action at law, one who in error libels in a foreign port a vessel which bears the same name as another vessel against which he has a claim, but which is otherwise in every outward characteristic totally different and readily distinguishable from the vessel which he is pursuing, shows such gross negligence, similar to malice, as to become liable for actual damages flowing from the detention.

THE BOARD OF CITY COMMISSIONERS, Bayonne, N. J., has received a proposal which contemplates a huge marine and industrial terminal at that city, to cost \$150,000,000, with warehouses, piers and railroad terminals.



Aeroplane View of United States Aeroplane Carrier Langley

Depression Leads British to Urge Government Aid

Scheme to Assist Shipowners to Replace Obsolete Vessels Proposed—Loans on New Ships and Bounties Suggested

By a Special English Correspondent

IF certain factors may be taken as reliable indications—and, so far as I can see, there is no reason why they should not—the shipping industry of the United Kingdom, and with it, presumably, that of other leading maritime nations, is in for what is universally known as “a lean time.” The root of the trouble seems to lie in the international, political, economic and financial conditions which continue to obtain, and unhappily there is, at this writing, little sign of improvement. The quarterly figures which the Chamber of Shipping have now issued, covering the laid-up tonnage in the principal ports of the United Kingdom, show how the grip of the depression tightened during the second quarter of the year, the laid-up tonnage on July 1, having increased by as much as 30 percent as compared with April 1. The Chamber’s figures relate to British and foreign shipping, and the extent of the fluctuations over a period exceeding twelve months will be seen at a glance from the following:

TONNAGE LAID UP AT THE PRINCIPAL PORTS OF THE
UNITED KINGDOM

Date, 1922.	England and Wales.		Scotland.		Ireland.		Total.	
	No.	tons.	No.	tons.	No.	tons.	No.	tons.
April 1 ..	394	699,977	67	98,089	23	38,553	484	836,619
July 1 ...	476	910,553	53	91,247	54	110,532	583	1,112,332
Oct. 1 ...	377	666,999	41	62,581	38	95,044	456	824,624
1923.								
Jan. 1 ...	353	633,818	37	86,153	21	12,227	411	732,198
April 1 ..	282	492,054	27	52,146	12	2,355	321	546,555
July 1 ...	324	636,774	27	63,853	21	8,475	372	709,102

POOR REPORTS FROM OLD-ESTABLISHED SHIPPING COMPANIES

There is another indication of the disquieting situation in which the shipping trade finds itself, and that is in regard to the annual reports and balance-sheets of the principal companies, which documents have lately been published in rather a bunch. Frankly, the results shown in some of these accounts are undeniably poor. Take, as an example, the old-established Anchor Line (Henderson Brothers), Ltd., whose profits during the past year amounted to only £23,238, being a reduction of no less than £127,000 as compared with the previous year and of £172,000 as compared with two years ago. The result is, indeed, the poorest since 1908-9, when the company sustained a loss of £16,000. The directors of the line make no secret of the fact that the conditions which ruled in the shipping industry during the currency of the report have been the worst for many years past.

Another well-known shipping concern whose earnings are a good deal below the level of previous years is Furness, Withy and Company, Ltd., the profits during the past financial year amounting to only £552,510, as compared with £655,206 a year ago, and slightly more than a million sterling in the year ending April, 1920. The directors, pursuing their policy of conservatism, have set aside £200,000 for depreciation the same as a year ago, and have reduced the dividend and bonus distribution from 10 percent to 7½ percent. Fortunately the company is in an excellent financial position, and it is by no means dependent on shipping for its livelihood, for its interests extend to insurance and many

other branches. Indeed, were it not for some of these subsidiary operations the company might have been hard put to make anything like a good showing this year, because a substantial proportion of the earnings were contributed by these “outside” bodies.

ACCOUNTS OF LARGEST CARGO CARRYING COMPANY

Touching on shipping accounts, the figures of the St. Just Steamship Company, Ltd., Cardiff, managed by Sir William Reardon Smith and Sons, Ltd., make particularly interesting reading, for the concern owns the largest cargo carrying fleet of any company in the United Kingdom, with the possible exception of one or two companies whose interests are linked up with leading liner companies. Unfortunately the accounts of the St. Just Company are presented in such a way that it is impossible to ascertain what the profits amounted to in the nine months covered. No alarm need be felt on this score, however, for it is the exception to the rule for British shipping companies to convey in their accounts anything like a real impression of the financial results of the services conducted. The history of this company, as vouched for by the managers, is certainly an interesting one, and serves the useful purpose of illustrating the fluctuations assailing shipping enterprises. The company was formed at the end of 1912 and commenced trading in April, 1913. The original capital of the company was £90,000, which was increased from time to time up to March, 1919, by several increases of capital and by amalgamation. The total cash subscribed by shareholders was £645,000, the balance of the present capital of £2,064,000 being by way of bonus shares. In addition, however, to the bonus shares, the shareholders have received dividends calculated on their actual cash investment at an average rate of over 15 percent per annum, free of tax.

LOOKS LIKE A SUBSIDY

So much for the past. Reverting to the current year, the directors have reduced by £500,000 the cost of the steamships and investments, less reserve for depreciation. That sounds like a fine achievement, but obviously this half-a-million sterling was not written off from earnings of £91,604. The sum is believed, however, to have been obtained from the Government in connection with the agreement that it should pay part of the increased cost of steamers ordered during the war, such increase having been contributed to or caused by the action of the Government in delaying completion while standard boats were building. The directors have decided to pay a dividend of only 1¼ percent, but, owing to various bonuses in the past, referred to above, this distribution represents a much greater percentage on the original capital of the company.

GOVERNMENT AID BY LOANS ASKED

With the continuance of depressing times it is only meet that captains of industry and others should look into the possible or probable remedies for shipping and other ailments. This line of action is now being taken in the United Kingdom. Mr. F. E. Powell, the chairman of the Anglo-American Oil Company, Ltd., and the President of the American Chamber of Commerce in London, is responsible for the suggestion that the Government should assist in arranging loans

at a low rate of interest to shipowners on new ships built within the next three years, to be repaid over a period beginning two years after the vessels are in commission. Mr. Powell's plan is to scrap the existing obsolete tonnage, and, in its stead, build new, up-to-date vessels.

BREAKING UP BOUNTY ASKED

In addition, to induce shipowners and others to scrap old or obsolete vessels, Mr. Powell thinks that the Government should make a proposal that on all old ships sold to be broken up, and where the owner places orders for an equivalent new tonnage, with British builders, the Government should pay a bounty of, say thirty shillings per ton deadweight of the vessel broken up during 1923, and half that amount on boats broken up during the next two years. The value of old ships as scrap being about thirty shillings per ton deadweight, Mr. Powell reckons that owners would get about £3 per ton for the old vessel. He considers that the result of this would be that every shipyard in England would be full of work, and that, as "there is hardly a port in England where the facilities are what they ought to be," the docks of the country could also be assisted to improve and enlarge. To sum up, Mr. Powell maintains that the Government should arrange loans at not more than 3 percent interest for approved work begun in 1923 and 3½ percent for work commenced in 1924. "After that, the position is to be reconsidered as regards further new work," Mr. Powell concludes.

Having outlined, in necessary detail, Mr. Powell's scheme, let us see where his suggestion, if carried through to its logical conclusion, would be likely to lead us. On the surface, the construction of such a large amount of tonnage as would be involved would be a good thing for shipbuilders and their employees, but it is useless to disguise the fact that, if such a situation were created, the shipbuilding and engineering workers would inevitably demand higher wages such as would cripple the whole deal. But, apart from this aspect, it is feared in quarters competent to judge that, while the suggestion might prove a satisfactory temporary palliative, it would probably be of no more permanent benefit than the "doles" now being paid to the unemployed. It is felt that the scrapping of obsolete and inefficient tonnage will take place as a matter of course in the near future, inasmuch as the cost of laying up will force the hands of owners directly the freight market outlook makes it clear that remunerative employment for the boats is not, and will not be, forthcoming. As to the suggestion that the Government should arrange loans for shipowners at 3 percent per annum, it is thought that if shipowners availed themselves of such an opportunity it would be suicidal for them, and with them others, to spend money on producing boats for which no employment could be found.

REGULATION OF SERVICES

A suggestion from another quarter which has received attention here revolves round what are termed the "off" seasons—notably the middle months of the year. In those seasons many more passenger and cargo liners run than the trade which is offering warrants, there being, of course, no agreement in existence to restrain companies from continuing to employ their surplus vessels at heavy losses. It is suggested, therefore, that, during these "off" seasons, the companies might restrict their services, with due regard to the convenience of passengers, shippers and mails.

As matters stand, each shipowner or shipping company would seem to fear that any individual attempt to adjust the freight situation on the lines laid down would have the inevitable result of diverting traffic to competitors. It is realized that the scheme, to be successful, would have to be dealt with internationally, but it is maintained that it ought not to be beyond the capabilities of leading shipping men to devise an arrangement satisfactory to all of the parties.

Arguments for and against the motorship continue to exercise the minds of British shipowners, but, whatever doubts some may have as to the future for this type of craft, Messrs. Furness, Withy and Company seem pretty well satisfied with their experiences, so far as they have gone. They have for some time been carefully investigating the possibilities of the internal combustion engines, and, to use the words of their chairman, Sir Frederick Lewis, while there is no doubt a certain amount of development work still to be done before this type of marine engine is perfected, and the extra cost of production militates against any extensive program until these costs are reduced, still, as a result of their experience, Messrs. Furness, Withy have felt justified in contracting for two new vessels to be fitted with internal combustion engines.

BATTLE OF THE PORTS

The "Battle of the Ports," with London, Liverpool and Southampton as the eternal triangle, goes on. One has grown accustomed to learn, at various periods, that first one, and then another, of these ports is destined to become the "Supreme Port of the World." Liverpool and Southampton having taken their turn, and, incidentally, to some purpose, it is now considered as only right and proper that the searchlight of publicity should be centred on London. The Port of London Authority, who, as its name implies, is the controlling body, proposes new port works which are estimated to cost five millions sterling, the new facilities including dock improvements and the erection of a landing stage at Tilbury. It has been decided to construct a new dock, with a passage 80 feet wide, within the triangle now occupied by the Canada, Center and Quebec Ponds, which will afford five additional ship berths, each 400 feet in length. At Tilbury, which is actually 26 miles from London, but nevertheless a part of the London dock system, the authority has decided that the time has come for an entirely new dock to be constructed, of a size, both as regards the entrance lock and dry dock, and with a water area, adequate to meet the requirements of any ship built, building or likely be built for many years to come. The new entrance lock will be 1,150 feet in length, and will have a breadth of 130 feet. A dry dock of similar dimensions is also to be provided, but at the outset the length will, temporarily, be restricted to 800 feet.

Perhaps chief interest, however, attaches to the new landing stage at Tilbury. Lord Devonport, chairman of the Port of London Authority, has pointed out that some people hold the view that London is not, and never will be, a great passenger port. That is not Lord Devonport's view. He considers that, given adequate and comfortable facilities, the passenger traffic will expand, and he anticipates with confidence a great development. Tilbury Dock is estimated by the Authority's chief engineer to be finished in five years, and the bulk of the remainder of the program in about two and a half years. It only remains to add that the Government is putting up four and a half millions of the money, which is repayable, at interest of 3½ percent per annum, over a period of 30 years.

STANDARD OIL TUG BOAT LAUNCHED.—The *Socony No. 9*, the second of two steel single screw tug boats building at the Tebo plant of the Todd Shipyards Corporation for the Standard Transportation Company of New York, was launched on August 6. These tugs are to be equipped with vertical compound surface condensing engines with cylinders 18½ and 40 inches diameter by 26 inches stroke designed for a speed of 125 revolutions per minute. Steam will be furnished at a working pressure of 160 pounds per square inch by Scotch marine boilers with a heating surface of 2,700 square feet and equipped with Todd fuel oil burning equipment. The tug boats are 105 feet 9 inches long overall, 24 feet molded beam and 12 feet 9 inches molded depth.

Two Recent Single Reduction Turbine Installations

Cruisers *Gustav V* and *Drottning Victoria* of Swedish Navy Obtain Excellent Trial and Performance Results

By J. D. Schmidt*

THE excellent results obtained on trials and the subsequent highly satisfactory performance in service, of the new cruisers *Gustav V* and *Drottning Victoria* of the Swedish Navy, have served to renew the interest which these vessels aroused when their construction was first proposed.

These two ships were contracted for before the war, but due to the unsettled conditions during, and immediately following hostilities, they were not completed until early in 1922. The final trials of the *Drottning Victoria* were run in June, 1921, and those of the *Gustav V* in January, 1922.

The hull of the *Gustav V* was constructed at Kockums

Mek, Verkstads Aktiebolag in Malmo, Sweden, and that of the *Drottning Victoria* at the works of the Gotaverken in Gothenberg, Sweden. The turbines for both vessels were built by the Aktiebolag Lindholman-Motala at Motala, Sweden, in accordance with designs furnished by the Westinghouse Electric and Manufacturing Company, and under the supervision of their representative. The gears were designed and built by the Westinghouse Machine Company at East Pittsburgh, Pa.

PRINCIPAL DIMENSIONS

Draft designed	20 feet 6 inches
Speed, maximum, knots.....	22.5
Shaft horsepower at maximum speed...	22,000
Propellers, number	2

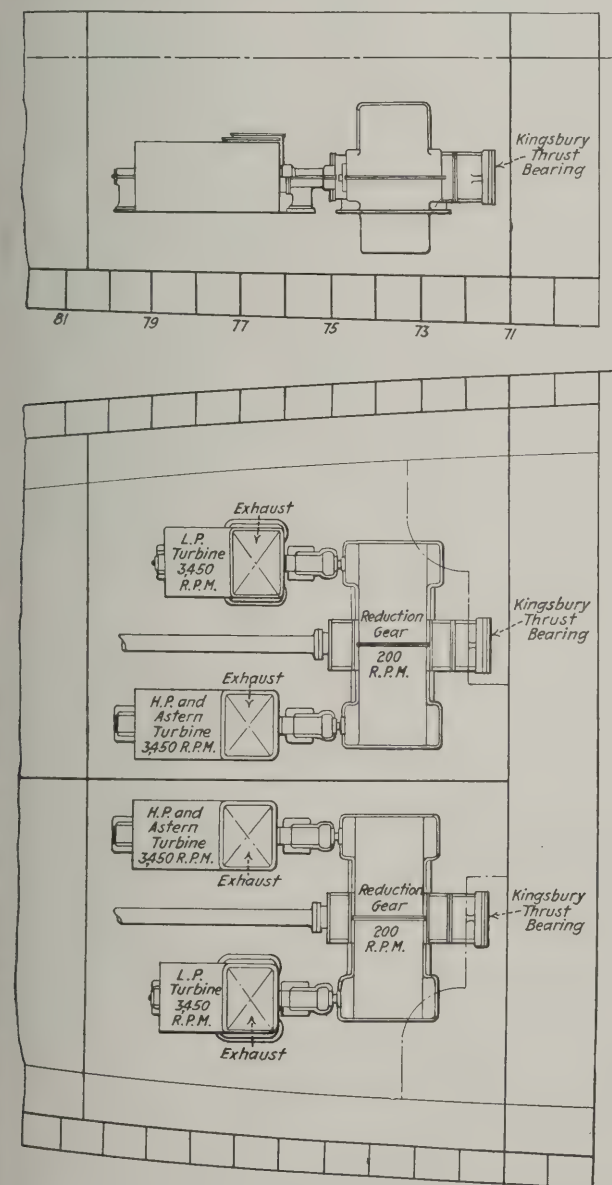


Fig. 1.—General Arrangement of Propelling Machinery

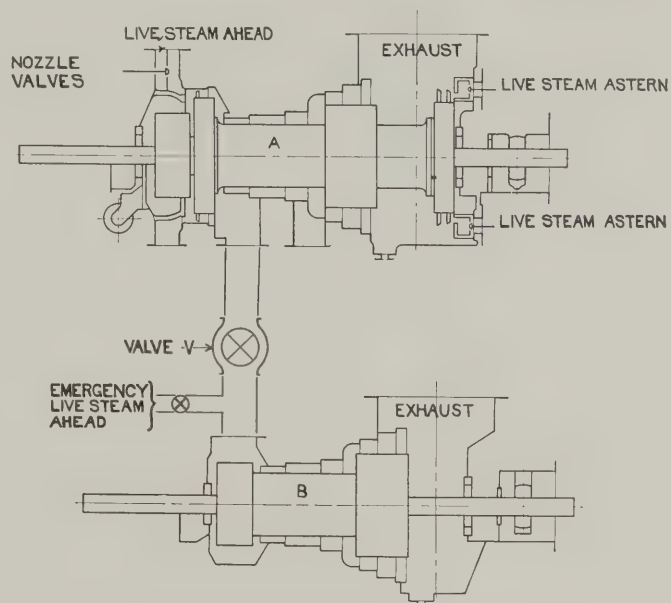


Fig. 2.—Showing Steam Path Through Turbines

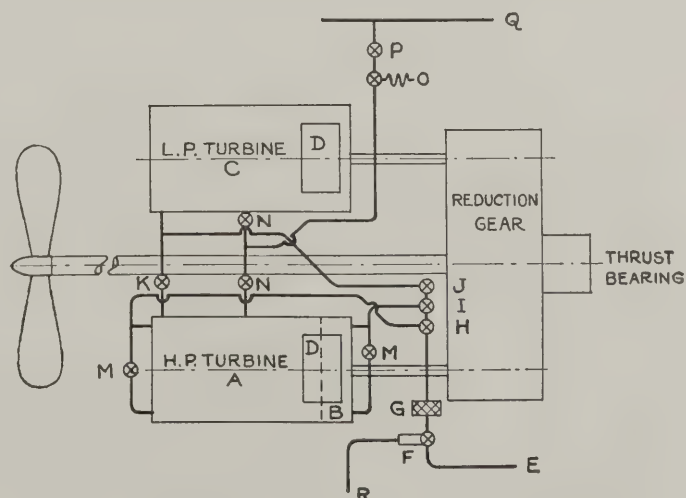


Fig. 3.—Diagrammatic Plan of Piping and Valves

The armament in each case consists of four 11-inch guns mounted in turrets forward and aft, eight 6-inch guns in the secondary battery, six 12 pounders and two submerged torpedo tubes. The normal complement is 408 men.

The propulsive equipment is located in two engine rooms amidship, each of the twin screws being driven by two turbines of the divided-flow type. The speed reduction is accomplished by means of two-pinion single-reduction double-helical gears. Vacuum is maintained by means of rotary air pumps and condensate pumps. The operating conditions are:

Steam pressure at turbine...265 pounds per square inch gage
Quality.....Dry and saturated
Vacuum in exhaust.....28.27 inches referred to 30-inch
barometer

The total weight given above is 63,065 pounds less than the total specified in the guarantee.

The general arrangement of the propelling units in the ship is illustrated in Fig. 1. Fig. 2 shows the steam path through the turbines, and Fig. 3 shows diagrammatically the piping, valves and maneuvering arrangements.

The divided-flow principle may be explained briefly as follows:

Turbines of low capacity are generally complete expansion units; i.e., the steam is expanded from inlet to exhaust pressure in a single cylinder. When the capacity exceeds certain limits, which vary with different manufacturers, the expansion must be split up, for structural and other reasons, and carried out in two or more cylinders. Where this is done

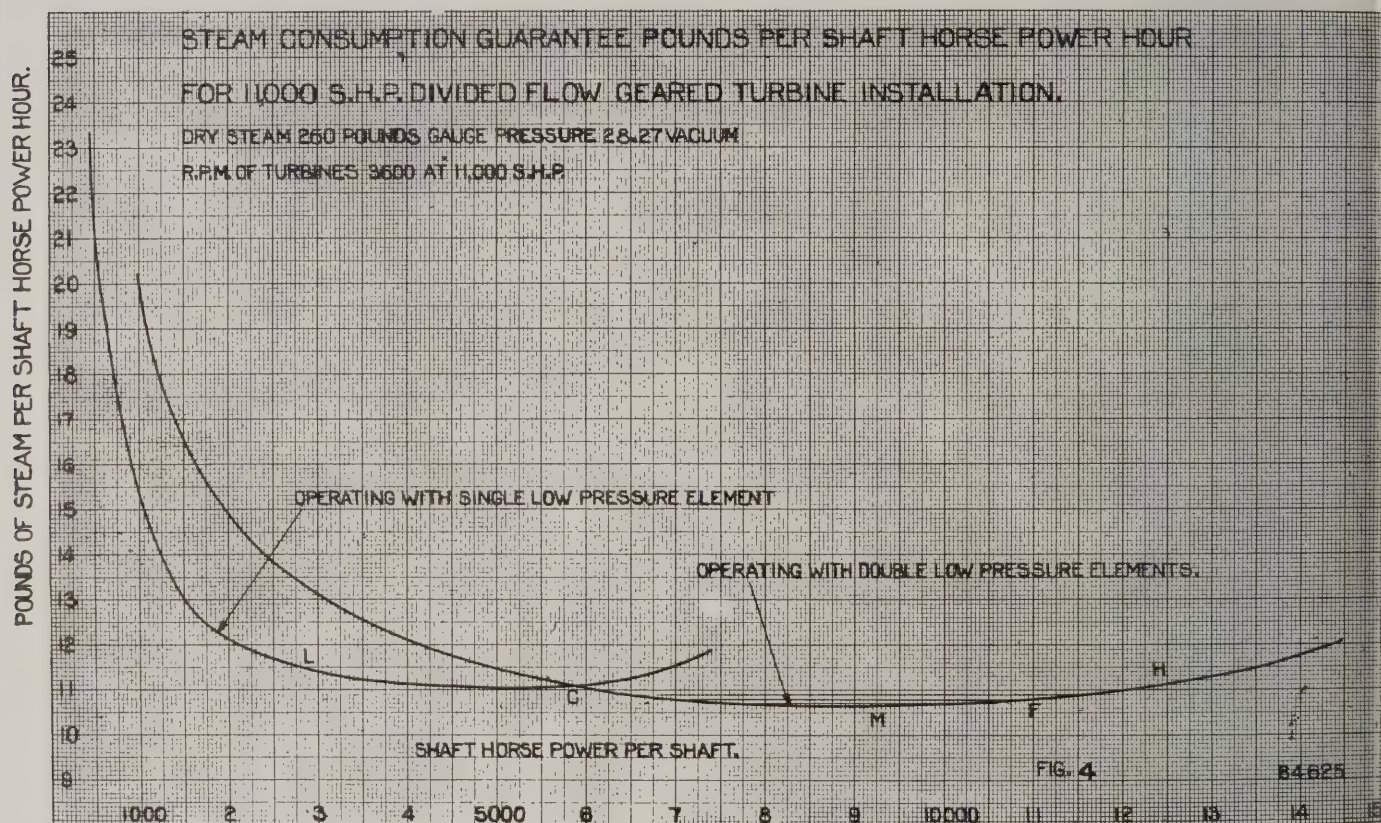


Fig. 4.—Chart Showing Guaranteed Steam Consumption

The steam consumption guarantees were as tabulated below:

Speed in knots (approximate)...	22.5	20	12.5
R.P.M. propeller	200	177	115
R.P.M. turbines	3,600	3,186	2,070
S.H.P. (designed)	22,000	15,000	3,150
Water, lbs. per SHP/HR.....	10.9	11.1	13.3

The designed maximum ship speed was 22.5 knots at 7,000 tons displacement for which it was estimated that 22,000 shaft horsepower would be required. On trial the *Drottning Victoria* maintained the contract speed of 22.5 knots at 6,950 tons displacement with 19,750 shaft horsepower. On the high speed trials of the *Drottning Victoria*, both the speed and the fuel consumption guarantees were bettered by considerable margins and the trial performance of the *Gustav V* was equally satisfactory.

The machinery weights per ship, as actually built, are as follows:

4 turbines	101,948 pounds
2 reduction gears.....	169,034 pounds
Piping valves, etc.....	19,942 pounds
Total pounds	290,924
Total tons (2,240 lb.).....	129.9

the two or more turbines comprising the unit may be used in series or in parallel. If they are used in series, all the steam passes first through the high pressure turbine, and the exhaust is led to the inlet of the low pressure turbine, which exhausts to the condenser.

These turbines, however, are in parallel. All the steam passes first to one turbine, (A, Fig. 2) nominally designated as the high pressure. After all the steam has passed through the first or impulse stage of this unit it is divided and while about 40 percent of the total continues on through the reaction stages of turbine A the other 60 percent is carried over through a cross-over pipe to the so-called low pressure turbine (B, Fig. 2) where it is expanded through reaction stages down to exhaust. Thus both turbines exhaust to the condenser and develop equal power, but one exhaust end handles 40 percent and the other 60 percent of the total steam. This is what is known as the divided-flow type.

PARTICULARLY SUITED TO NAVAL VESSELS

This type of turbine is particularly suited to the purposes of a naval vessel inasmuch as a high efficiency can be maintained over a considerable range of speed without resorting to the additional complication of a cruising turbine.

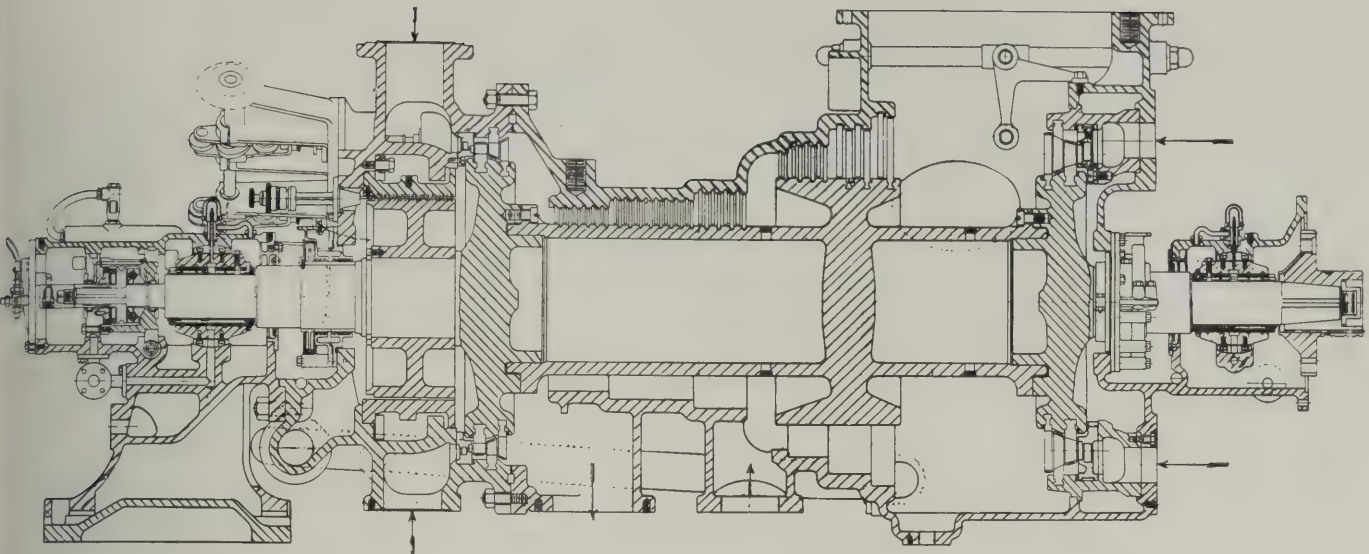


Fig. 5.—Section Through High Pressure Turbine

The results obtainable with this type machine are shown in the water rate curves given in Fig. 4. The method of procedure in operating at various powers is as follows:

When steaming at full speed the steam path is as described in the preceding paragraph. At reduced speeds, however, the cut-out valve between the high pressure and low pressure turbines is closed, see Fig. 2, causing the steam to flow through the reaction blading of the high pressure turbine only, the low pressure turbine meanwhile revolving idly in high vacuum, or being disconnected if the reduced power is to be maintained for a considerable period.

This arrangement improves the economy at cruising speed since a small turbine is used at full or nearly full power, instead of using both turbines at reduced power. The reduction in area for the flow of steam consequent upon cutting out the low pressure turbine improves the pressure distribution and increases the efficiency of the turbine. The blading of the high pressure element is also especially designed for efficient operation at cruising speed, extra rows of blades being provided. Since the low pressure turbine is used only at approximately full speed, its blading is arranged for this condition only, less rows being required than would ordinarily be the case. This design also permits a high speed of rotation, thereby reducing the weights considerably. In

case of emergency either turbine may be used independently of the other, making complete break-down a remote contingency. Furthermore, since the turbines have a great overload capacity it would be possible, in case of emergency, to develop three-fourths or more of full load power with one turbine only.

One of each pair of turbines is equipped with an astern turbine in the same casing, which is capable of delivering 41 percent of the ahead power with the same steam flow, or 9,000 shaft horsepower at full power.

DESCRIPTION OF TURBINES

The ahead high pressure turbine consists of a two-row impulse wheel followed by reaction blading on a drum as shown in Fig. 5. The ahead low pressure turbine, which is illustrated in Fig. 6, contains reaction blading only. The astern turbine is located in the exhaust chamber of the high pressure ahead turbine and consists of a single two-row impulse wheel.

The cylinder of the low pressure turbine is made entirely of cast iron. The cylinder of the high pressure turbine is made in two sections, the low pressure end being of cast iron and the high pressure end, which contains the nozzle chambers, being made of cast steel.

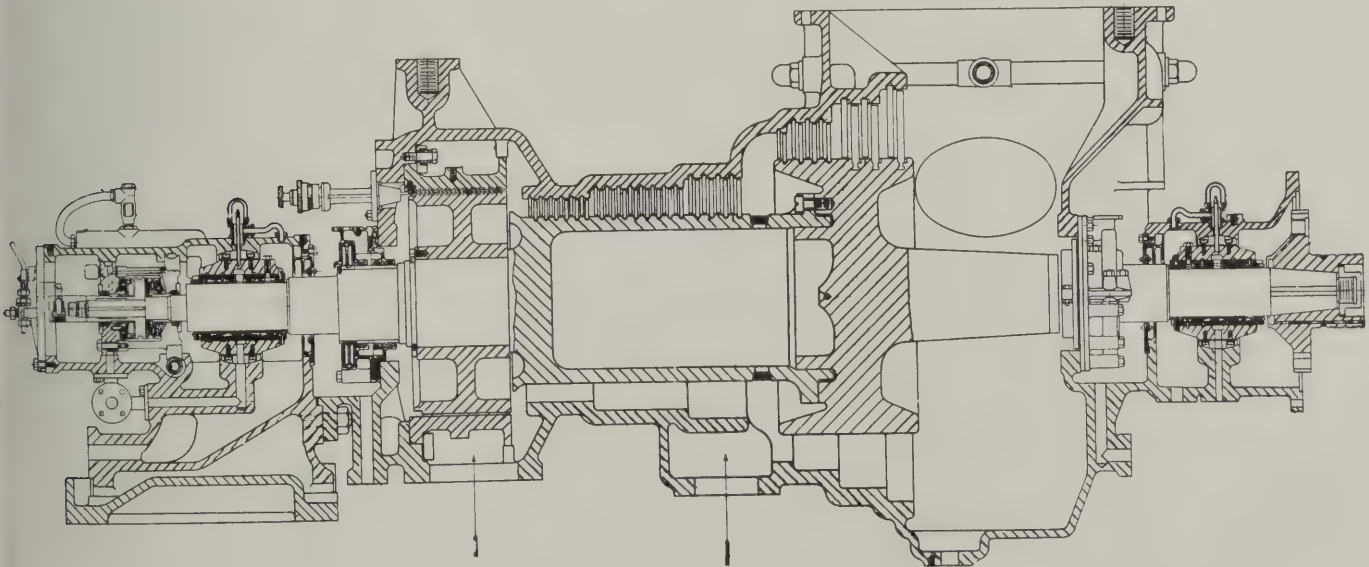


Fig. 6.—Section Through Low Pressure Turbine

The rotors of both turbines are made of forged steel. In the high pressure turbine the impulse wheel is carried on a solid disk formed integral with the spindle end. (See Fig. 5.) The high pressure stages of the reaction blading in both turbines are carried on drums; the low pressure stages of the reaction blading in each case are carried on a solid disk, which in the high pressure unit is integral with the drum, but in the low pressure turbine is part of the spindle end. This construction is clearly shown in the assemblies, Figs. 5 and 6.

The impulse blades are machined of nickel steel and are secured in the rotor by a substantial tongue and groove construction. The reaction blades are made of drawn phosphor-bronze and are secured in dove-tail grooves by a positive mechanical interlock between blades, packing pieces and grooves. This construction is shown in Fig. 7. The ahead turbine nozzle chamber, shown in Fig. 5, is divided into compartments, each of which is provided with a group valve, hand operated from the maneuvering platform, for closing off part of the nozzles at reduced power. The steam thrust is partly balanced by means of balance-pistons of the labyrinth

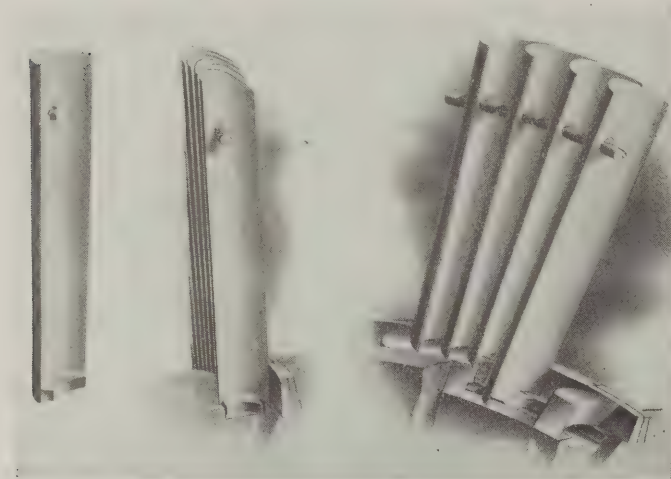


Fig. 7.—Details of Reaction Blading

type located at the inlet ends of the high and low pressure turbines.

STEAM AND WATER SEAL GLANDS

The glands are a combination of the steam seal and water seal types, as shown in Fig. 8. The steam gland is sealed from an annular chamber in the usual manner. The water seal operates on the principle of a centrifugal pump, the impeller being provided with radial paddles or ribs which revolve in a chamber supplied with water at the periphery of the impeller. The centrifugal action of the paddles on the water in this chamber causes it to revolve and to form an annulus of water around the outer circumference of the impeller, thus forming a perfect seal against leakage of air.

The water seal is designed to be effective from full speed down to half speed. Below half speed the centrifugal force imparted by the impeller is not sufficient to maintain the seal and therefore, when cruising or maneuvering below half speed, or when standing by, it is necessary to use the steam gland. Steam is supplied to the labyrinth glands at a pressure of about 5 pounds per square inch gage. Water is supplied to the water glands at a pressure corresponding to a head of about 10 feet, the supply being taken from the feed water system through a suitably placed overhead tank.

The main bearings are of the self-aligning type and are provided with pads and liners for adjusting the position of the rotor.

The thrust bearing is of the Kingsbury segmental type

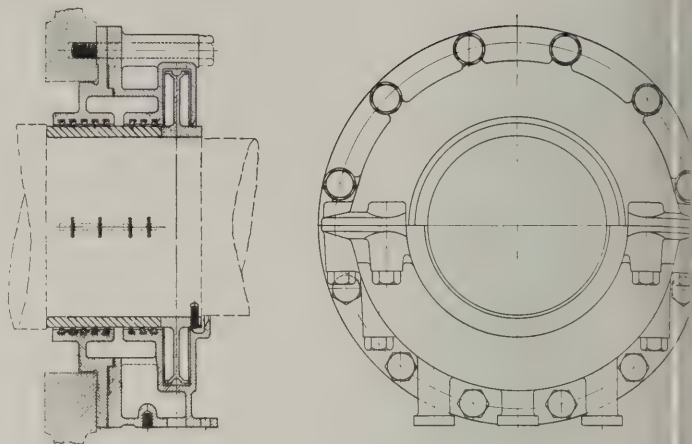


Fig. 8.—Steam and Water Seal Gland

and is provided with a screw adjustment for moving the rotor endwise for setting the dummy clearances.

The turbine shaft is connected to the flexible pinion driving shaft by means of a flexible pin coupling, which permits the pinion to move endwise. Provision is made for lubricating the coupling pins and bushings.

THE EMERGENCY GOVERNOR

Each turbine is fitted with a Westinghouse type emergency overspeed stop governor located at the thrust end of the machine, beyond the thrust bearing. This device consists of an eccentric weight held by means of a suitable spring and retainer in a hole drilled transversely in the shaft. In the event of overspeeding of the turbine from any cause, when the rotor reaches a predetermined number of revolutions per minute fixed by the relation of the spring scale and eccentricity of the weight, the centrifugal force on the weight becomes great enough to overcome the resistance of the spring and the weight moves radially outward. The relation of the parts is such that when the weight begins to move its centrifugal force increases more rapidly than the compression of the spring so that it at once moves out to the limit of its travel. In so doing it strikes a trip lever, located in the plane of its motion, the hardened end of which rests normally about 1/16 of an inch away from the circumference of the turbine shaft.

The displacement of this trip lever opens a valve which admits steam to the operating cylinders of the throttle valve and the auxiliary exhaust inlet control valve causing them to close.

The emergency stop governor may be reset by means of a

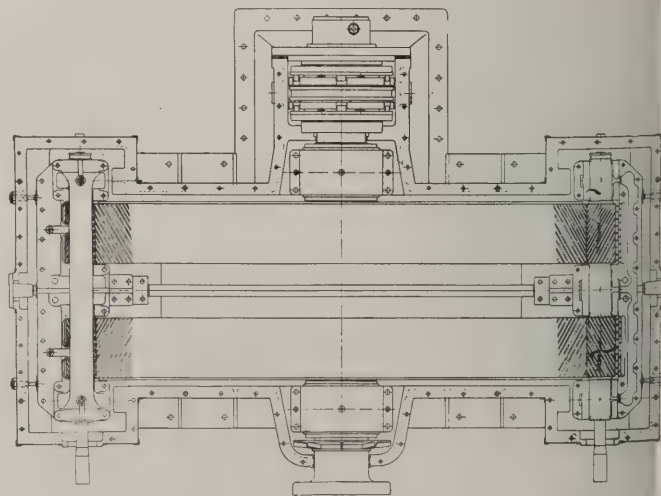


Fig. 9.—Floating Frame Type Reduction Gears

hand lever on the end of the bearing pedestal and as soon as it is reset balance is restored and the valves re-open automatically.

Just ahead of the governor valve in the main steam line is a steam strainer consisting of a cylindrical perforated steel strainer fitted in a cast iron body.

The admission of steam to the ahead and astern turbines is controlled by two single piston valves having circumferential ports and a pilot valve by means of which the pressure above and under the valve is equalized in the act of opening. These valves are placed on a stand at the after end of the gear case and alongside the main valves is placed the throttle valve for admitting emergency steam to the low pressure turbine. With this valve arrangement it is possible to operate either ahead turbine independently of the other in case of emergency. Nozzle control valves are furnished to permit the nozzle area to be adjusted to suit the operating conditions in order to maintain the best possible efficiency at all times. These valves are likewise located so that they may be opened or closed without leaving the maneuvering platform.

REDUCTION GEARS

The reduction gears are of the Westinghouse floating frame type as shown in Fig. 9. A Kingsbury segmental thrust bearing is located at the forward end of the gear, to take the propeller thrust. At the designed full speed the gears reduce the revolutions from 3,540 to 200, the reduction ratio being 17.23 to 1. Each pinion transmits 5,500 horsepower, the total for one gear being 11,000 horsepower.

The gears are completely enclosed in an oil-tight cast-iron box divided on a horizontal plane. The gears are of the double helical type, the teeth being inclined at an angle of 30 degrees. The teeth are of involute form and are cut with the utmost precision to obtain quiet and reliable operation.

The pinion is of the three-bearing type, as shown in Fig. 9, and is carried in a heavy floating frame supported on I beams, which automatically maintain the alinement of the pinion and gear under all conditions of load, thereby producing uniform distribution of pressure over the entire length of tooth face. The pinion is driven by a flexible shaft, see Fig. 9, which extends through it and is secured to the end distant from the coupling. The flexible coupling permits the pinion to move endwise, and the flexible shaft permits the floating frame to function without restraint. The resulting uniform

distribution of tooth pressure permits the use of higher pressures and smaller pinions and gears than is the practice where rigid bearings are used.

The pinions, Fig. 13, are single forgings of carbon steel. The gear wheels are composed of a heavy forged-steel shaft, cast-iron center and cast-steel rims. The gear and pinion bearings have heavy cast-iron bodies lined with white metal, and are supplied with oil from the main oiling system, the pressure at the inlet to the gear case being about five pounds per square inch. A copious supply of oil is sprayed on the pinion so as to pass between the meshing teeth and afford the required lubrication and cooling.

KINGSBURY THRUST BEARING

The Kingsbury thrust bearing, which takes the thrust of the propeller, is located at the forward end of the gear, and is composed of a single collar, which operates between segmental shoes made of forged steel and lined with babbitt. Each shoe is pivoted on a hardened seat, which permits it automatically to assume the position required to distribute the load uniformly over the entire surface. This uniform distribution of pressure due to the self-alinement of the shoes, gives perfect film lubrication, which permits the use of a considerably higher unit pressure than is used in ordinary thrust bearings, and also gives greater reliability of operation.

The principal parts of the bearing are made of forged and cast steel. The bearing is lubricated by a continuous circulation of oil, which is admitted near the bottom and completely fills the casing, the outlet pipe being led from the top of the casing and returning the oil to the drain system.

LUBRICATING SYSTEM

The lubrication of the main turbine bearings and the gear teeth and bearings is effected by a continuous circulation of oil through a pressure system composed of delivery and return piping, pumps, cooler, strainer and tank. Oil is supplied to the bearings and teeth under a pressure of about five pounds per square inch.

The turbines were constructed in Sweden as before mentioned and it speaks well both for the thoroughness of the design and the character of the craftsmanship of the Aktiebolag Lindholm-Motala, that the machinery was delivered without a hitch and has since established an enviable reputation for continuity of service and simplicity of operation.



The U. S. S. Colorado, the World's Mightiest Super-Dreadnaught

New British Marine Oil Engines Developed

Beardmore Builds Largest Semi-Diesel Ever Installed in Cargo Vessel—Richardsons, Westgarth Construct Modified Tosi Engine

By Our Special London Correspondent

UP to the present time, British shipowners have paid comparatively little attention to the possibilities of what in England is generally called the semi-Diesel or hot-bulb motor, for the propulsion of cargo ships. Considerable surprise was therefore evinced when it became known that Beardmores, the well-known Clyde shipbuilding firm, had produced two engines of this class, the largest ever constructed, for installation in a cargo ship of about 4,000 tons deadweight.

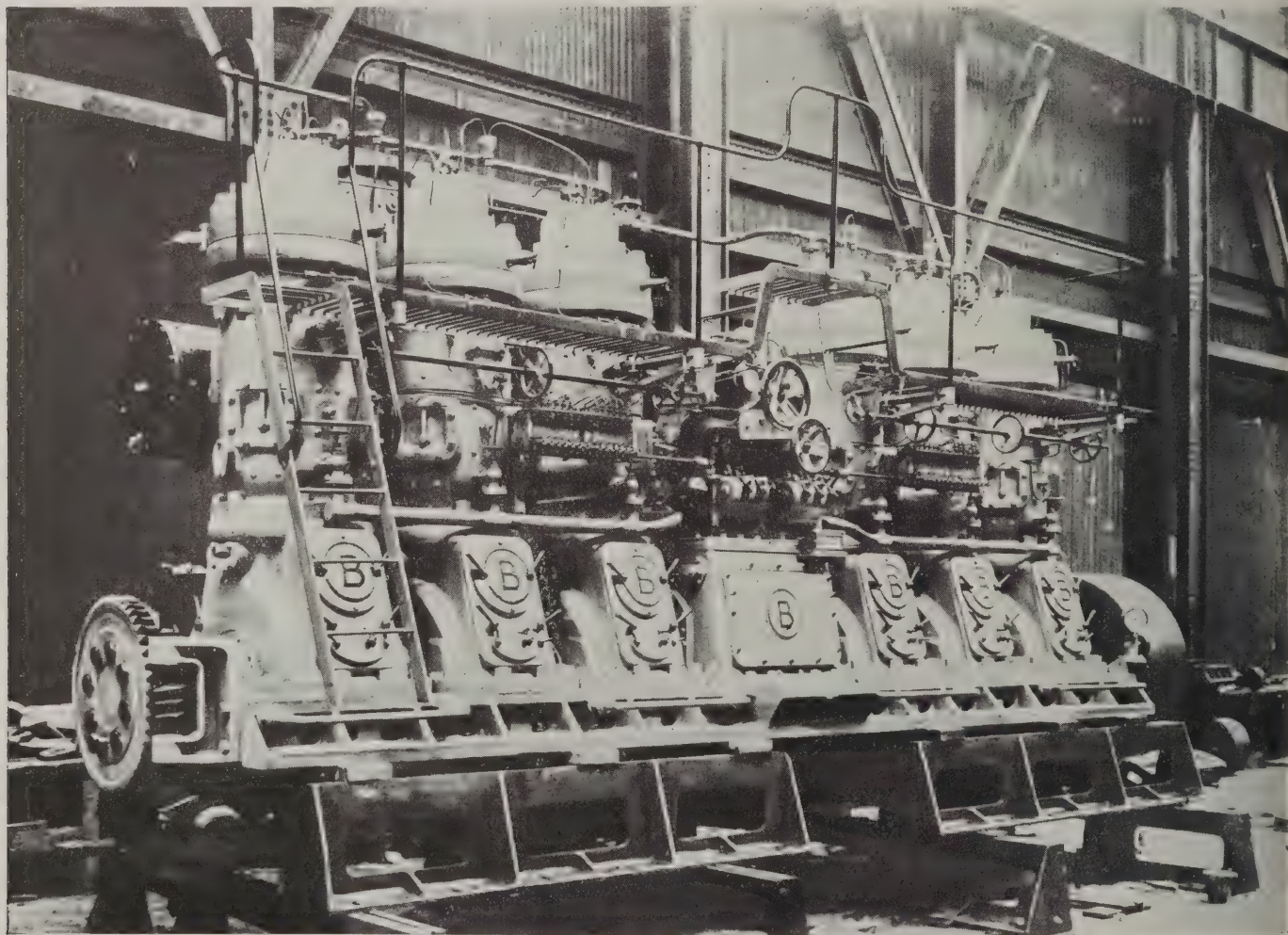
There are numerous vessels of this size, some of them quite recently built, and equipped with machinery of equal power, in which a Diesel plant is utilized, and it would thus appear that competition would now arise between semi-Diesel and Diesel engine builders in connection with ships of moderate tonnage. It is a curious fact that Beardmores are also manufacturers of ordinary Diesel motors, but the two types are constructed in separate works.

The ship referred to, which is now fitting out at Bristol, is 310 feet in length with a beam of 43 feet 6 inches, and the two new engines which are to be installed are designed to develop 750 brake horsepower, although the normal working output will be 600 brake horsepower. The largest semi-

Diesel motor that has hitherto been produced is of 500 brake horsepower and several of this type have been constructed by Bolinders, by the Kromhout firm, and by Vickers Petters.

A SAVING IN WEIGHT

There is a considerable saving in weight in the new Beardmore motor in comparison with the Diesel engine, since this amounts to only 45 tons, whereas with the latter design, the weight would probably be in the neighborhood of 80 tons. Presumably there is a corresponding reduction in capital cost, which is an important point since the average motorship costs between 15 and 30 percent more than a corresponding steamer. The bore and stroke are 18 inches and 24 inches respectively with a speed of 185 revolutions per minute for full power. As will be gathered from the illustration, the engine is of normal semi-Diesel type, so far as crank chamber compression is concerned, and this involves the construction of separate cylinder units, each with its own self-contained crank chamber, in which the scavenging air is compressed to about 3 pounds per square inch on the downward stroke, before being admitted to the cylinder through ports in the bottom. The



A 750-Brake Horsepower Semi-Diesel. The Largest of its Type Yet Built



The 10,000-Ton Motor Tanker Scottish Borderer

cylinders are cast separately, being flanged at the bottom for bolting on to the crank chamber, and at the top for the attachment by means of bolts of the water cooled cylinder cover.

ELECTRIC HOT PLUG

The "hot bulb," if it can so be called, is of special design, owing to the fact that the heating effect preliminary to starting, which is always necessary in semi-Diesel motors, is provided by an electric plug arranged in the top of the bulb and not by a blow lamp, which is the ordinary system. This plug, which projects into the combustion space is wound with a resistance wire, and when a current is passed through it, becomes sufficiently hot in about 20 seconds to allow the engine to start up. Thus the new motor suffers under little, if any, disadvantage in comparison with a Diesel engine in this respect.

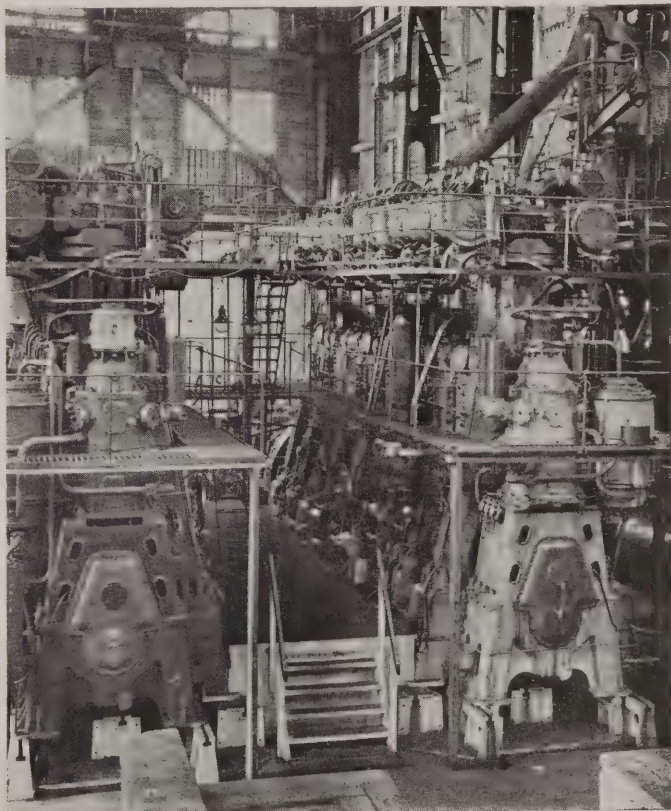
Starting is accomplished by admitting compressed air to the cylinders through automatic non-return valves in the cylinder head, the necessary distribution being effected through mechanically operated distribution valves, arranged between the two sets of three cylinders. The six fuel valves are also located at this point and deliver through automatic valves, and it is to be noted that the timing of injection is the same for ahead or astern running, so that in reversing no alteration has to be effected. This process is therefore carried out by turning the starting wheel, which only controls the admission of compressed air. The engine represents a noteworthy departure and as the manufacturers are said to be contemplating building still larger sizes, the performance of the first vessel equipped with these engines may have some influence upon motorship construction—at any rate in the smaller types.

THE RICHARDSON TOSI ENGINE

In the year 1922, the largest output of reciprocating steam engines in the United Kingdom, was achieved by Richardson, Westgarth and Company of Hartlepool and Middlesbrough. The first marine Diesel engine built by this firm, therefore, possesses more than ordinary interest, especially as it has adopted a very conservative policy before developing along these lines. The twin screw installation has just been completed for a 6,000-ton Furness Withy motorship, and although the design is based upon that of the engines built by the well-known Italian firm, Tosi of Legnano, Richardson, Westgarth and Company have introduced a number of modifications. This has in fact been the case in practically all the Continental Diesel engines which have been taken up by British builders under license.

COMBINED VALVE FOR EQUALIZATION OF TEMPERATURE

The new Richardson-Tosi motor is of the four-cycle type with six cylinders, 24.41 inches bore and 38.39 inches stroke, the output at 120 revolutions per minute being 1,250 brake horsepower or 1,550 indicated horsepower with the rather high mechanical efficiency of 80 percent. In one feature, this engine differs from all other designs. The same valve is used for the admission of the air on the suction stroke, and the discharge of the exhaust gases; the control for the two purposes is effected by a semi-rotary valve which puts the combined valve first in communication with atmospheric air and secondly with the exhaust pipe. There are two of these combined valves in each cylinder cover so that there is more valve gear than with a normal design. It is claimed, however, that the equalization of temperature thus produced,



A Twin Screw Richardson-Tosi Installation for a 6,000-Ton Motorship

and the cooling of the valves by the incoming air, are advantages that warrant the extra expenditure, and the result is that the valve may operate for very long periods without having to be reground.

Another novelty is the system of reversing. Its chief object is to avoid having to move the heavy camshaft fore and aft as is commonly done. The reversing mechanism, therefore, merely lifts the valve levers off the cams, and then causes the rollers of the levers to move the necessary distance to bring them over the astern cams. Forked pieces are provided at the end of the valve levers, with a horizontal spindle, along which the rollers may move. Instead of operating the reversing mechanism by an air servo motor, a small electric motor is used for the purpose. One advantage of this arrangement is that there is a saving in compressed air. All the valves are arranged in cages and the valve levers are jointed in such a way that by uncoupling these joints, the valves can be removed from the cylinder head without dismantling any further gear.

POPULARITY OF MOTOR TANKERS

Tank ships are, of course, very suitable for propulsion by internal combustion motors, and it is notable that a large

proportion of the orders that have recently been placed for vessels carrying oil in bulk are to be propelled by Diesel engines. Among the latest contracts, are a 10,000-ton ship to be built by Armstrong Whitworths for a Belgian concern, and equipped with Sulzer type machinery of 2,700 brake horsepower, a 5,000-ton motor tanker with a Nobel Diesel two-cycle engine, of 2,000 brake horsepower, a 12,800-ton vessel for a Norwegian concern, to be equipped with 4,000 horsepower Werkspoor machinery, and a 6,500 tonner for Dutch owners, in which an 1,800 brake horsepower Harland & Wolff engine is fitted.

There has just been completed at Denny's yard on the Clyde, an interesting tanker, as she is the first vessel of this class to be fitted with British built Sulzer machinery. The *Scottish Borderer*, as she is named, is the fifth motor tanker constructed for the British Tanker Company, Ltd., and she carries 10,000 tons of liquid fuel. Two engines, of 1,250 brake horsepower each, with four cylinders are fitted, and, unlike most of these motors, drive their own scavenging pumps, the independent turbo-system not being adopted. A speed of 11 knots is attained on a fuel consumption of about 9 tons daily. The auxiliary machinery, contrary to usual practice, is steam driven.

Chemicals Endanger Carriage of Iron Goods

Smoke Helmets Sometimes Required to Enter Holds—Delayed Insurance Claims Causing Difficulties — Norwegians Fear Compulsory Insurance

By "Bordereaux"

IRON goods in transit often suffer serious damage through chemical influences. There has been considerable complaint, of late, of injury to consignments of such merchandise at Buenos Aires, the cargoes including iron wire, sheet iron, steel tubing, etc. It was at first supposed that sea water was the cause of the damage, but more complete examination made it appear most improbable that a ship could have stood up under such inroads of water as would have been necessary to have done the damage in evidence. Observation of steamers arriving at the South American port has led to the belief that the action of chemicals is properly chargeable with the results. It is now insisted that special care must be taken in stowage. Such corrosive chemicals as chloride of lime and acetic acid ought never be taken into the same holds with iron goods.

Captains and shipping agents too frequently try to conceal this sort of thing, but that only delays the employment of necessary remedies. It is stated that there are instances where stevedores, unloading cargo, have had their hands and clothing burnt because chloride of lime had fallen out of broken casks on the rest of the cargo in the hold; and, cases are cited where the holds could only be entered by men wearing smoke-helmets, because the vapors from broken jars of chemicals abounded and had seriously rusted all the iron goods in the holds. There is considerable business in the insurance of particular average, but unless the losses are infrequent there is no profit in it to the insurers. Checking of the stowage seems to be more important than surveys before loading.

Delayed Claims

THE late presentation of claims is one of the peculiarities of marine insurance and an element that contributes not a little to its difficulty. In the case of vessels, the repair of damages that do not disable the ship may be delayed for a long time if freights are good and the owners do not wish to lay the vessel up. Owners may delay the collection

of claims even when the repairs are made. Collision cases frequently involve prolonged liquidation extending over several years. Cargo damages often bring hundreds of consignees into the problem, with almost endless communications with parties scattered all over the world. During the war, these complications were enormously aggravated and the improvement to date has not been great. The framing of marine accounts, in consequence, becomes a matter of the utmost difficulty.

British Hull Values and Rates

IN England hull values and rates continue to be reduced under spur of violent competition. It is the old trouble—too much marine insurance facility and too little business. It is said that values as low as £2 have been fixed for recent cover. At no previous stage in its history has the British market quoted rates as low as it is now doing, especially as concerns the smaller type of vessel. Certainly, there is no justification in the claims experience for such action. A very large number of steamers have been renewed at values and rates below those that prevailed in 1914. It is hard to understand why underwriters will persist in so doing, especially when it is borne in mind that repair bills are still about fifty percent over pre-war cost; and the steamers are nine years older.

War Risk Award Reversed

THE war risk insurance award of \$280,105 granted the Standard Oil Company of New Jersey by the Federal District Court of that State has been set aside by the United States Circuit Court of Appeals at Philadelphia. The lower tribunal had held that the loss of the vessel, which was the tanker *Llama*, came within the terms of the policy. The *Llama* went down in Westray Firth, off the English coast, in October, 1915. She was en route to Copenhagen

and struck a submerged rock, stranding and subsequently sinking. The United States carried her war risk but payment was refused on the ground that her loss was not due to a war peril. Now the Court of Appeals rules that the vessel's loss resulted from a marine peril and to errors of navigation; not from a war hazard.

Cargo Rates for Munson Line

RECOMMENDATION has been made by the Underwriting Conference Committee that for rating purposes the Shipping Board owned steamers operated by the Munson Line out of United States Gulf ports to the East Coast of South America be granted the same basis of classification as the cargo boats operated by the Lamport & Holt Line in the same trade.

Hull Insurance in Norway

UNDERWRITING and shipping interests in Norway are greatly relieved that the new Norwegian cabinet, which came into office a few weeks ago, is to proceed no further with the compulsory insurance scheme fostered by a previous Government. The enforcement of this proposal was postponed one year ago, under stress of the unanimous opposition of owners and underwriters, to enable owners to effect a consolidation of the mutual insurance clubs. Since that time the number of these clubs has been considerably reduced and a consolidation and reorganization of those that remained has been effected. A claims office for the compilation of statistical data has been established and the insurance companies have joined it, and there has been a general revision of the insurance conditions of the mutual associations. In view of these improvements a general alarm went the rounds when it was intimated that the Government was to discuss discussion of the compulsory scheme in parliament. Happily, the Government has "seen a great light" and will drop the matter and let good enough alone.

Liability of Carrier

CCOURT definition of the legal responsibility of a carrier was given in an opinion recently handed down by the United States Circuit Court of Appeals, Ninth Circuit, in a libel in admiralty by the Willamette Navigation Company vs. the Hartford Fire Insurance Company, 287 Fed. Rep., 464. The navigation company undertook the transport of certain rolls of paper, by the steamship *Ruth*, under a bill of lading subject to the condition that the carrier should not be responsible for loss or damage resulting from "the perils of the lakes, seas, or other waters, or from collision, stranding or other accidents of navigation." The navigation company took out insurance with the Hartford Fire by open policy "for account of themselves, loss, if any, payable to assured."

The *Ruth* stranded and sank, and a quantity of the paper was damaged. The navigation company filed a libel against the insurance company to recover, under the policy, the amount in part of the loss and damage to the paper.

The Circuit Court of Appeals held that the navigation company, being a bailee for hire, whether as carrier or warehouseman, could lawfully insure the entire interest in the paper entrusted to its care for carriage or storage, and, if loss occurred, would be entitled to demand and collect from the insurer the entire amount of the loss sustained covered by insurance. However, in such case it would hold the excess above its own interest in the paper for the use and benefit of the owners of the paper, or others concerned therein.

In support of this holding citation was made of the case of the Munich Assurance Company vs. Dodwell & Co., 128 Fed. Rep., 410, in which it was said:

"We think that the true doctrine is that the carrier has an insurable interest in goods in his possession as such, to the full extent of their value, against a loss for which it is possible that he may become responsible, and that the question whether he has the right to recover under the policy is not to be determined after the loss by inquiring whether in fact he is then liable to the owners of the property for the value thereof or for damage thereto. . . . It had the right to insure against its own negligence, as well as against the necessity of being required to enter into the inquiry whether its own negligence caused or contributed to the stranding of the vessel."

Turning to the policy, the court expressed the view that the insurance being "for account of themselves," comprised a particular person; that is, the assured, to whom the loss is payable. Cooley's Briefs on Insurance was quoted: "The general rule is that a policy made in the name of a particular person will not protect the interest of any other person, unless the words 'for whom it may concern,' or their equivalent, indicate that it is intended that the interest of some other person be covered."

It was also shown by the authorities that a policy in the name of one joint owner of a vessel "as property may appear," without a clause stating the insurance to be for the benefit of all concerned, does not cover the interest of any other joint owner. It was further held that where the insurance policy issued to the carrier covered only the carrier's interest in the cargo, there could be no recovery thereon for the shipper's interest in the cargo, where the loss resulted from stranding of the ship, for which the carrier, under the bill of lading, was not liable to the cargo owner.

Excursion Steamers for Wilson Line

(Continued from page 535)

piston type fire and donkey pump suitable for a working pressure of 210 pounds. The pump cylinders are of cast iron heavily brass lined and brass fitted and are of the separate cylinder type. The steam valve gear is of the outside adjustable tappet type with link connection to cross heads, permitting of adjusting the stroke of pump while in motion.

There is one 4¼-inch by 4¾-inch by 5-inch vertical duplex piston pattern fresh water pump with cast iron pump cylinders, brass lined and brass fitted for fresh water supply to all lavatories, sinks and ice and hot water systems through a pressure tank on the boat deck.

There is one 6-inch by 6-inch by 8-inch vertical duplex piston pattern sanitary pump having a cast iron pump cylinder, brass lined and brass fitted. The steam valve gear of this pump is also of the outside adjustable tappet type with link connection to the crosshead. . . .

There are two 6-inch by 3½-inch by 6-inch horizontal duplex piston pattern special fuel oil service pumps, designed for 300 pounds oil pressure. The pump cylinders are of cast iron and are especially designed for fuel oil service.

For circulating brine on the refrigerating system there are two 4½-inch by 3¾-inch by 4-inch vertical duplex piston pattern pumps having cast iron pump cylinders, brass lined and brass fitted.

For ice water circulating, there are three 4½-inch by 2¾-inch by 4-inch vertical duplex piston pattern pumps with cast iron pump cylinders, brass lined and brass fitted.

The steam cylinders of all of the foregoing pumps are covered with 85 percent magnesia and lagged with planished iron, making a very neat finish.

A hot water circulating pump and heater are fitted for the hot water supply to the sinks, lavatories and showers throughout.

Protective Coverings for Shipbuilding Purposes: Paints—Bottom Compositions

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

BOTTOM compositions on steel ships have to fill two functions,—that of preventing corrosion and that of preventing fouling. This has led to the general practice of having the bottoms painted with two kinds of paint over the priming coat, the inner coating being called anticorrosive paint and the outer, antifouling paint. Corrosion is not a factor on wood ships but the antifouling paint on them has also to serve the purpose of preventing the attack of the teredo and other marine wood borers which honeycomb the wood. Corrosion is also not a factor on concrete ships; and as factors peculiar to concrete ship construction enter into the subject of bottom compositions for these vessels, this matter has been dealt with in the writer's article on "Cement and Concrete for Shipbuilding Purposes" in the June and July 1922 issues of this magazine. Furthermore some bottom compositions that adhere well to steel ships have not been found to adhere well to concrete.

The antifouling properties of the general run of antifouling compositions result from the use of a poisoning ingredient which is usually mercuric oxide in paints for steel ships and copper oxide in paints for wood ships. The latter composition is often called copper paint. Some copper paints also contain mercuric oxide. A very interesting series of tests of the toxic value of these chemicals, together with copper cyanide, copper acetate, copper chloride and mercuric chloride, have been made by Mr. A. W. L. Bray of Washington University, St. Louis, Mo.; and these tests indicate that copper cyanide would be very efficient in an antifouling paint. The copper acetate, copper chloride and mercuric chloride are probably so soluble in sea water as to afford a very brief protection. The solubilities are about as follows:

	Grams per 100 Grams of Solution.
Copper Oxide	Trace
Copper Cyanide	Trace
Mercuric Oxide	.05
Mercuric Chloride	12
Copper Acetate	13
Copper Chloride	47

The American Society for Testing Materials started out in 1921 to test the anticorrosive and antifouling properties of a great many compositions, which they applied to steel panels immersed in Raritan Bay, N. J., and also at Charleston, S. C. On a part of the panels anticorrosive paint only was applied. The poisons used in the antifouling paints were yellow mercuric oxide, mercuric arsenate, mercuric phenate, mercuric oleate, cupric oxide, cuprous cyanide, zinc cyanide and zinc stearate. These were added to a mixture of Spanish oxide, zinc oxide and asbestine to make a total pigment content of 40 percent, the vehicle being 60 percent in every case. Results reported at the annual meeting in June 1922 indicated the advisability of limiting further tests of antifouling paints to those containing copper and mercury compounds, and such further tests were decided

upon. Copper compounds alone or in mixtures with other poisons showed excellent antifouling properties in the Raritan Bay tests, but were not as satisfactory as the mercury compounds when immersed at Charleston, S. C.

There is also a type of antifouling composition which is of a saponifying nature, and a gradual sluffing off of the paint prevents the adhesion of marine growths.

ANTIFOULING PAINTS MUST BE FREQUENTLY RENEWED

The antifouling paints at the best do not retain their protective properties many months and hence vessel bottoms have to be repainted at regular intervals. There are, therefore large amounts of bottom compositions used, and as a result there are a number of proprietary bottom compositions on the market; and they are in many cases applied by their manufacturers, whether the vessel is at a shipyard or in drydock. As with all other materials, the extended results of actual service are of more value than theoretically excellent formulæ, laboratory tests, etc.; and having the former to fall back upon, the designer, owner or operator will usually approve the use of some proprietary composition with which he has had favorable experience and gives himself no further concern. Where a vessel has been coated with a satisfactory brand of bottom paint it is desirable to continue the use of the same compositions, or at least to use a brand closely resembling them; because considerable of the earlier paint will adhere and the film becomes gradually built up to a thick coating, the various layers of which should act together properly. A large user of bottom compositions will usually have an approved list of these paints. Such a list in this country for steel ships will be apt to include some of the following well known makes, and possibly others:

Red Hand	Leonard Miller
Federal	Germicide
McInnes	Amalgamated
International	Reliance
Newport News	

SPECIAL BOOTTOPPING PAINT

In addition to the anticorrosive and antifouling paints, there is a boottopping paint that is applied in the region between the light waterline and the deep load waterline. It is required for the reason that antifouling paints do not stand up well when alternately wet and dry, and also because the usual topside paint does not offer sufficient abrasive resistance to the action of the waves. Good practice on steel ships is to apply one or two coats of anticorrosive paint, as may be necessary, from the keel to the deep load line, one coat of antifouling from the keel to the light waterline and a coat of boottopping from the light waterline to the deep load line. On both steel and wood ships there should generally be a first coat of priming paint. The only exceptions to this are cases where a kind of bottom composition is used that is known to give better results with the anticorrosive paint applied to the bare steel.

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

REQUIREMENTS OF BOTTOM COMPOSITIONS

Essential requirements of bottom compositions, in addition to the fact that each coat should perform its particular functions, are that they can be applied rapidly and will dry rapidly. In many cases a vessel will go into dry dock, have the bottom cleaned and painted and be out again the same day. It is desirable that the antifouling paint differ somewhat in color from the anticorrosive paint, so that failure to properly coat any portions of the surface can be readily detected.

The poisoning element in antifouling paint is heavy and tends to settle to the bottom of the container and even to the bottom of buckets used while applying it. It is therefore necessary to stir it up thoroughly and frequently.

About 20 years ago the U. S. Navy Department began testing a number of different anticorrosive and antifouling paint mixtures at the U. S. Navy Yard, Norfolk, Va., with a view toward developing a paint of their own; and the results of this investigation together with a lot of valuable information about bottom compositions are given in an article by Mr. N. E. Adamson, assistant shop superintendent of that Navy Yard, in the August and September, 1922, issues of this magazine. The formulæ of the antifouling and anticorrosive paints there given show the characteristic composition of these paints, and the uses and values of the different ingredients are very clearly set forth by Mr. Adamson, who also points out the possibility and desirability of having one kind of paint for both the anticorrosive and antifouling duties. The tests are not yet completed.

Of 21 formulæ first tested at the Norfolk Navy Yard, formula 17 for anticorrosive paint and formula 19 for antifouling paint gave the best results and were found to greatly exceed the merits of the proprietary paints compared with them. They have been adopted by the Navy Department, except as to the kind of alcohol, and are as follows:

Quantities Required for 1 Gallon		
	Anticorrosive	Antifouling
Grain alcohol	3 qts.	4 pts. 3 gills
Gum shellac, Grade A.....	13 oz.	1 lb. 8 oz.
Turpentine	2 gills	3 gills
Pine Tar Oil.....	2 gills	3 gills
Zinc Oxide, dry.....	3 lbs.	1 lb. 8 oz.
Zinc dust	1 lb.	x
Indian red, dry.....	x	1 lb. 8 oz.
Mercuric oxide, dry.....	x	12 oz.
Weight per gallon	11 lbs. 8 oz.	10 lbs. 8 oz.

These formulæ were adopted by Dr. P. H. Walker of the Bureau of Standards and Dr. H. A. Gardner of the Institute of Industrial Research in the paint specifications prepared by them in 1917 for the U. S. Shipping Board Emergency Fleet Corporation, except that the grain alcohol was denatured by the addition of 5 gallons of approved wood alcohol to each 100 gallons of grain alcohol, the oxide of mercury was reduced to 8 ounces per gallon, and silica, to the same amount as the Indian red replaced it in the antifouling paint. Tests made by the Norfolk Navy Yard on modifications of the above formulæ had indicated that Indian red was not a desirable pigment for an antifouling paint and that better results would be obtained by the substitution of silica. Requirements of the Emergency Fleet Corporation specifications were as follows:

ANTICORROSIVE BOTTOM PAINT

The paint shall be furnished in prepared form ready for application. It shall be made of the ingredients in the proportions given. The shellac shall be thoroughly dissolved in the alcohol before mixing and milling with the other ingredients.

The zinc dust used shall contain not less than 90 percent metallic zinc as such, the balance consisting mainly of zinc oxide. The pigment portion of the paint shall be of such fineness that 98 percent shall pass through a 300 mesh screen.

The paint must be satisfactory in every respect, including body and freedom from objectionable settling or hardening in the can. The paint must have satisfactory working qualities, hiding power, drying value, and color. It must be resistant to sea water.

ANTIFOULING BOTTOM PAINT

The paint shall be furnished in prepared form ready for application. It shall be made of the ingredients in the proportion given. The shellac shall be thoroughly dissolved in the alcohol before mixing and milling with the other ingredients.

The paint shall be tinted with lampblack to a color approximately that of the low visibility gray for hulls, a color card for which is to be seen at each district office.

The paint must be satisfactory in every respect, including body and freedom from objectionable settling or hardening in the can. The paint must have satisfactory working qualities, hiding power, drying value, and color. It must be resistant to sea water and poisonous to marine growths.

BOOTTOPPING PAINT

The paint shall be a zinc oxide paint in a vehicle of best quality water resisting varnish, with volatile thinner, which may be either turpentine or mineral spirits, or a mixture of these, and liquid drier.

The paint shall contain not less than 35 percent by weight, of pigment.

The pigment shall consist of zinc oxide tinted to the desired slate color with lampblack. (Leaded zinc oxide may be used, but in any event the total pigment must contain not less than 93 percent zinc oxide.)

The vehicle portion of the paint should contain at least 40 percent varnish which should comply with the specification for Emergency Fleet Corporation Varnish, the balance to consist of linseed oil, drier, and turpentine or mineral spirits.

The paint must be satisfactory in every respect, including body, freedom from objectionable settling or caking in can, working qualities, hiding power, fineness, drying, color, gloss, and durability under alternate exposures to sea water and air.

These specifications were adopted in 1918 by the War Service Committee of the Paint Industry.

One of the shipyards has for a number of years manufactured Navy standard bottom paints to Navy specifications and used them on all of the Government vessels built at their plant. In recent years they have been under contract with the U. S. Shipping Board to furnish bottom compositions to Shipping Board specifications for several ports. The ingredients used and their amounts reduced to a per gallon basis are as follows:

Anticorrosive		Turpentine	
Alcohol	2.92 qts.	.....	3.2 gills
Gum Shellac	12.8 oz.	Pine Tar Oil	3.2 gills
Turpentine	1.92 gills	Zinc Oxide	22.1 oz.
Pine Tar Oil	1.92 gills	Indian Red	22.1 oz.
Zinc Oxide	2.84 lbs.	Oxide of Mercury ..	12.0 oz.
Zinc Dust	.96 lbs.	Boottopping	
Antifouling		Spar Varnish	4.25 pts.
Alcohol	2.4 qts.	Drier	2.19 pts.
Gum Shellac	22.1 oz.	Mineral Spirits	.85 pts.
		Venetian Red	2.91 lbs.

This company for a number of years has also been manufacturing proprietary bottom compositions similar to the Navy standard paints but with some substitutions that enable them to be sold at little more than half the price of the Navy standard paints. These include the use of rosin oil varnish instead of shellac and alcohol, and part turpentine substitute instead of all pure turpentine, in the anticorrosive paint, and the use of some coal tar naphtha in both the anticorrosive and antifouling paints. The boottopping paint is practically the same as above given. The manufacturers are in a position to observe the results of actual service of these compositions, in comparison with the Navy standard compositions, which gives considerable weight to their claims for these proprietary paints.

Antifouling paints which contain copper as the poisoning element have generally been considered undesirable on steel ships on account of the galvanic action set up between steel and metallic copper when in salt water which results in a rapid corrosion of the steel. However, some proprietary paints of this kind are often used on steel ships. One of these has approximately the following analysis:

		Anticorrosive	Antifouling
Pigment .....	.....	40%	60%
Vehicle .....	.....	60%	40%

Zinc oxide	7.5%	11.0%
Iron Oxide	32.0	24.5
Copper Oxide	x	22.0
Talc	x	2.5
Quick drying varnish	37.5	20.0
Pine tar and naphtha.	23.0	20.0
	100.0%	100.0%

A test made on a submerged plate, referred to by Mr. Adamson, in which cuprous oxide replaced the mercuric oxide in the Norfolk Navy Yard paint, showed after five months a film that was harder and more free from rust than the standard film, although it also showed that the copper paint would not prevent barnacles from becoming attached to the steel. The safer plan, however, is to use the mercury paints on steel. Copper paints are favored for wood ships.

Specifications for copper paint adopted by the U. S. Shipping Board Emergency Fleet Corporation for their wood ships are as follows:

The paint shall contain finely ground natural iron oxide. This oxide shall contain at least 40 percent Fe_2O_3 . It shall also contain copper oxide in amount sufficient to insure not less than 12.5 percent by weight, of copper in the completed paint.

The total pigment shall be not less than 44 percent, by weight, of the paint.

The non-volatile vehicle shall be not less than 30 percent, by weight, of the paint. The paint must dry satisfactorily to a tough salt water resisting film. It must have satisfactory working qualities, freedom from objectionable settling or caking in can, must be suitable for use on wood bottoms and have good antifouling and protective properties. The bottom of the vessel up to the light water line will have three coats of Standard Copper Paint.

Specifications prepared in 1918 by the War Service Committee of the Paint Industry followed the above very closely. They were as follows:

Pigment 44 percent.

Liquid 56 percent.

The pigment portion shall consist of finely ground natural iron oxide. This oxide shall contain at least 40 percent Fe_2O_3 . It shall also contain finely ground copper oxide in amount sufficient to insure not less than 12.5 percent of copper (Cu) in the completed paint.

The liquid portion shall consist of pine tar oil, drier and suitable thinners. The non-volatile liquid shall be not less than 25 percent of the paint.

Special requirements: The paint shall dry satisfactorily to a tough salt water resisting film and shall be suitable for use on wood bottoms and have good antifouling and protective properties.

One of the proprietary copper paints on the market has as its ingredients rosin oil varnish, coal tar naphtha, Venetian red and oxide of copper.

As with bottom compositions for steel ships, there are a number of proprietary paints on the market that have proved their worth in actual service; and the designer, owner or operator will usually find it to his advantage to approve the use of one of these paints. Approved lists may be expected to contain such brands as:

Woolsey	Cape Cod
New Jersey	Newport News
Baltimore	International
Cape Anne	Davis

Some of the proprietary paints contain more copper than called for by the above stated formula, and should be expected on that account to give better protection. Although the formula contains the amount of copper called for by the Navy Department and they have found after testing and examining a large number of paints of various formulæ that their paint with $12\frac{1}{2}$ percent metallic copper fully met their requirements, the very best copper paint is none too good a protection in some waters.

Three coats of copper paint of good quality may be expected to afford good protection for a period of about six months against marine wood borers although complete metal or wood sheathing is the only certain protection. Cementing the seams is of value in this connection. Wood ships should not be laid up in salt water, if it can be avoided, although

northern waters that have not in the past been infested with marine wood borers are reasonably safe.

Auxiliary Vacuum Pumps Used to Advantage

ABOUT three years ago one of the 12,000-ton Lake freighters was having considerable difficulty in maintaining proper vacuum, particularly while maneuvering in and out of port. Incidentally, this difficulty is not by any means uncommon. However, a remedy was found for the trouble in this case.

This particular ship had a ballast pumping installation consisting of two 14-inch centrifugal pumps and two reciprocating pumps for drainage. The pumping installation had been made with a connection from the condenser to the manifold so the engineer on the ship, as an experiment, started up the ballast pumps to see if they would help the vacuum any. He found a decided gain, especially when in maneuvering it was necessary for the engine to turn over slowly. Soon after this, an auxiliary air unit, consisting of two radojets, was installed and these, in conjunction with a turbo tail pump, are used for port service and at sea, if for any reason it is necessary to shut down the main air pump and also when an additional vacuum is desired for maneuvering. This auxiliary system can be operated at about 75 percent of the capacity of the main pump.

In general this system has been so satisfactory that all new vessels built for the steamship company on which the first unit was tried out will be equipped with radojets and a turbo pump as the main unit and not for auxiliary service alone.

NEW INTERCOASTAL SERVICE.—The Intercoastal freight and passenger service recently announced by the United American Lines will be opened by the steamship *Sudbury*, which will sail from Baltimore on September 8 and from New York, September 13. Fourteen modern vessels will operate in a weekly service between Baltimore and New York, Los Angeles Harbor, San Francisco, Portland, Seattle and Tacoma.



(Photograph by Kadel & Herbert, N. Y.)

Famous North Pole Ship Becomes a Tug

The *Roosevelt*, famous exploring ship which carried the expedition of Admiral Robert E. Peary to the North Pole in 1909, and which has lain idle in Puget Sound for several years, has been purchased by a barge company and will be converted into a sea-going tug. The *Roosevelt* was built in Portland, Me., in 1905, and was associated with all the exploring expeditions of Admiral Peary. In 1915 the Government purchased the vessel and used it for several years in the Coast Guard service. The *Roosevelt* has a solid oak ice crusher bow, 24 feet thick. When the carpenters finish with her she will be one of the staunchest and most powerful tugs on the Pacific.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Life of Chain Cable

Q. (1,210).—Chain cables must be renewed when $\frac{1}{8}$ thickness in diameter has worn out. If so, how many years are chain cables good for resistance against the corrosion of salt water—any accidents being out of the question? K. S.

A. (1,210).—This question can only be answered in a general way because very little trustworthy information upon the subject is available. First class wrought iron chain may be considered to have a life of about ten years. The distorting and stretching of the links of the cable by excessive strains during proof tests and service eventually result in failure to engage the wildcat lugs properly. Probably this is as often the cause for its discarding as is the wastage due to corroding.

Most Economical Steam Pressure at Engine

Q. (1,211).—We have a twin screw job developing 2,200 indicated horsepower at 130 revolutions per minute, the high pressure valves cutting off approximately 64 percent of the stroke, and boiler pressure at 150 pounds, and throttle full open. For certain reasons we have cut the revolutions per minute down to 115, and I cannot shut the high pressure link in far enough to give me the required speed with throttles full open; I put a liner 1-inch thick back of the drag link brasses, but even that is not enough, and they will not stand any more.

My problem is this: Which is the most economical way of running (a) to use full boiler pressure and throttle to the required revolutions; or, (b) to cut down boiler pressure to give the required revolutions and run with throttles full open. In our case 135 pounds boiler pressure will give the required revolutions.

The proper way of course is to run at full boiler pressure, throttles full open and link up, or put lap on valve and advance sheave, but I cannot do this at present, so I have to do the next best thing. I cannot find any definite information in any of my books and would like this matter discussed, and the reasons for and against.

A. (1,211).—It has been found from experimental trials that it is not so economical to carry high steam pressure on the boiler and throttle down to the pressure required, as it is to carry the boiler pressure at about 25 pounds above that desired in the high pressure chest. In the case of a triple expansion engine the boiler pressure can not be dropped much below 100 pounds. A still lower desired pressure in the high pressure chest makes throttling necessary. Several factors enter into the making of this limiting pressure of 100 pounds.

Should there be a reducing valve in the auxiliary steam line the main steam could not be lower than its setting. Again, such auxiliaries as generators, main feed pumps and fire room blowers may begin slowing down to the point where they will fail to function properly even though no ill effects are shown in the running of the main engine.

High boiler pressure with a fireroom force of little experience has the advantage of requiring less careful attention in holding conditions constant and insures a safe steam reserve for maneuvering, but it has the disadvantage of increasing the heat loss by radiation and water loss from leakage. While throttling may produce some superheat, yet it will not be sufficient in amount to be of material value.

Reducing Valve in Steering-Engine Steam Line Dangerous

Q. (1,212).—Is there any economy in installing a reducing valve in a steering-engine steam line, where we are at present running under 150 pounds pressure, the reduced pressure to be say 65 or 70 pounds per square inch? Please give reasons.

A. (1,212).—Steering engines are constructed to take steam the full length of stroke, and the drying or slight superheating of the steam on the low pressure side of the reducing valve would have no economical value. Inasmuch as you are operating the steering engine on boiler steam it is probable that it was designed for high pressure and would not function properly on low pressure steam. Aside from this, the installing of a reducing valve introduces an element of danger. When a steering engine is wanted it is wanted badly. Should for any reason the valve fail to operate and the steam be cut off, a more or less serious casualty to the vessel might result. A relief valve and steam gage should always be fitted on the low pressure side of the reducing valve, and there should also be a by-pass connection around the valve.

Fuel Oil Consumption

Q. (1,213).—In good practice, what is the average consumption per indicated horsepower with fuel oil? Is 1.78 pounds of oil per indicated horsepower for all purposes excessive?

A. (1,213).—The fuel oil consumption per indicated horsepower varies not only with the power and service of the vessel in question but with the skill of the operating personnel, the tightness of joints, the condition of the vessel's bottom as to foulness, weather, etc. The following figures are based upon what may actually be expected under average service conditions covering a long period of time and not upon what might be expected under fairly good conditions, and may therefore seem somewhat high.

Deadweight Tonnage	Indicated Horsepower	Pounds Oil per Indicated Horsepower, all purposes.
3000 to 4500	1000 to 1200	1.75 to 1.6
5000 to 6000	1500 to 1800	1.6 to 1.5
7000 to 8000	2000 to 2250	1.5 to 1.4
8000 to 9000	2400 to 2800	1.4 to 1.30
9000 to 10000	2800 to 3000	1.30 to 1.25
10000 to 12000	3000 to 3600	1.25 to 1.20
Over 12000 (tank steamers)	4000 to 6000	1.20 to 1.15
Intermediate liner		1.15 to 1.10
Large passenger liner		1.15 to 1.10

Use of CO₂ Recorders

Q. (1,216).—Is the CO₂ recorder used to any extent in marine work in the United States, and who supplies these instruments?

A. (1,216).—The CO₂ recorder is not used to any great extent in the merchant service, but it is believed that engineers are beginning to see its value more and more as a fuel saver.

Among those manufacturing CO₂ recorders may be mentioned: The Chadburn (Ship) Telegraph Company of America, Inc., Troy, New York; The McNab Company of Bridgeport, Conn.; Foxboro Company, Foxboro, Mass., and Schaeffer and Budenberg Manufacturing Co., New York.

LETTER TO THE EDITOR

Combined Riveting and Welding

Referring to the editorial in the July issue of MARINE ENGINEERING AND SHIPPING AGE under the above heading, the writer is in favor of combined riveting and welding where such construction is not too expensive.

We still have considerable to learn about welding, but there is no question but that welded joints will hold when they are properly made. The writer has had experience with both kinds of welded joints—those that hold and those that let go. The principal objection to the welded joint is the old so-called "personal factor" which is present but not to the same extent in the riveted joint. Besides, the welded joint does not lend itself so readily for inspection and testing. It is easy for a poor welder to "cover up" his poor welding.

It has been demonstrated in the making of tanks that the addition of welding is beneficial for two reasons—first, it makes the joint stronger, and, second, it makes the joint leakless and calking becomes unnecessary.

As for the questions which are asked, "Will a combination of riveting and welding work in unison or will the weld which unites the metal in one piece take the entire load and the elastic limit of the joint be reached before the rivets begin to work?" This question can hardly be answered positively because so much depends upon the nature of the weld. If properly done, there can be but little question that the weld and the riveting will act in unison, but there is no telling in advance or possibly even after the welding is done that the two will work in unison and we must "take a chance" just the same as we are taking chances right along even with riveted work, and for which we use a factor of safety in nearly all engineering practice. By carefully annealing the welding after it is finished it is quite probable that the welding and riveting will act in unison. If the welding is not annealed, the chances are that there will be some internal stresses and both the riveting and the weld will be stressed somewhat due to the initial welding stresses and even before the load is applied. This is not alone "theory"—it has been proved in practice.

As for the second question—"If riveting cannot be depended upon for such a connection why not make an entirely welded joint?" The answer is already partially given. Neither joint is absolutely dependable. Nothing is absolutely perfect. But by both welding and riveting the joints we have a "duplication" which is usually desirable for the same reason that two pumps on boilers are desirable, two main steam lines in the power plants, two boilers, two engines, etc. To my way of thinking a joint that is both riveted and welded is more dependable than one that is only riveted or only welded. Some exhaustive tests on this subject are surely needed by the engineering world.

New York.

N. G. NEAR.

PERSONAL MENTION

M. C. JACKSON has been appointed general superintendent of the Philadelphia-Norfolk Steamship Company, with headquarters at Norfolk.

M. M. VIPOND, known among the shipping men of the Port of Norfolk for many years as the special deputy collector of customs, has assumed the title of Assistant Collector of Customs.

A. W. DAVIDSON, former representative of the United American Lines at Hamburg, Germany, has assumed the

duties of marine superintendent of the United American Lines at 39 Broadway, New York.

W. K. SEMPEY, formerly with the China Mail Steamship Line, has been appointed general freight agent of the Los Angeles Steamship Company, succeeding G. C. Foster, resigned, and will have headquarters at Seattle.

JAMES T. STEWART, formerly superintending engineer for the Army Transport Service at Brooklyn and Hoboken, has accepted the position of assistant port engineer for the Division of Operations, U. S. Shipping Board, New York District.

E. H. WEATHERSPOON, marine electrical engineer, has opened an office at 149 Broadway, New York, and will act as eastern representative for manufacturers of marine equipment, including the Charles J. Henschel Company, Inc., of Amesbury, Mass., electrical engineers and manufacturers.

JAMES GEISTMAN has been appointed general manager of the Marine Iron & Shipbuilding Company, boiler makers, shipbuilders, machinists and foundrymen, foot of Eleventh Avenue West, Duluth, Minn. John Abernethy is general superintendent, B. J. Roberts, assistant superintendent and John Sinclair, repair superintendent.

H. J. WAGNER has been formally installed as traffic commissioner of the Norfolk and Portsmouth Freight Traffic Commission. H. V. C. Wade, who prior to the organization of the Commission was traffic manager of the Norfolk-Portsmouth Chamber of Commerce, is assistant traffic commissioner of the new body.

W. A. MILLER, formerly port engineer of the Baltimore Steam Packet Company, at Baltimore, has been appointed by W. L. Seddon, vice-president of the company, as superintendent to succeed the late Captain J. H. Delano. Mr. Miller has been with the Old Bay Line for several years and is thoroughly familiar with the position.

J. S. MAHOOL has been appointed traffic manager of the Panama-Pacific Line of the International Mercantile Marine Company, which will resume service, interrupted in 1915, between New York and California. For the past three years Mr. Mahool has been assistant general manager of the Red Star Line in Antwerp. He is a native of Maryland, and has been in the service of the International Mercantile Marine Company since boyhood. His headquarters will be at 1 Broadway, New York, and he will have charge of both passenger and freight business of the coast to coast line. The ships selected to open the new service, the first sailing of which is scheduled for October 18, from New York, are the *Kroonland*, *Finland* and *Manchuria*.

FREDERICK W. COWIE, consulting engineer of the board of harbor commissioners of Montreal, has been appointed expert advisor of the Hampton Roads (State) Port Commission. The immediate duties of Mr. Cowie will be to aid the state commission in preparing a report and recommendations to the next General Assembly of Virginia, visualizing the future of Hampton Roads as a state asset, and showing how the state will be benefited by participation in its expansion and its development. Mr. Cowie has spent thirty-six years with the St. Lawrence Ship Channel and board of harbor commissioners of Montreal, being chief engineer of the latter from 1907 until last year. During his term in that capacity he supervised the construction at Montreal of what is considered one of the most successful terminal projects in the east. The terminals are self-supporting and are building a surplus. Included in recent work Mr. Cowie has done on the Atlantic seaboard are surveys and reports, with recommendations on the harbor of Boston and a comprehensive plan on the development of Savannah as the state port of Georgia.

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

Southern Pacific Asks Bids for New Passenger Vessel

PRELIMINARY plans and specifications have just been completed by the Southern Pacific Company for a combined passenger and freight ship and sent it to various shipyards for estimates on the cost of construction.

This vessel, which is to be used in service between New York and New Orleans, will probably be followed by a second vessel, the plans for which are now being considered by the company. Bids submitted for the present vessel will be taken under consideration for further action about September 30.

Estimates have been made by the shipbuilding companies, to whom plans have been submitted, on a vessel 445 feet length overall, 427 feet length between perpendiculars, beam 57 feet, depth to hurricane deck 37 feet 6 inches, draft 25 feet 6 inches, with a deadweight tonnage of 7,000 at this draft. She is to be a single screw vessel, driven by double reduction geared turbines of 6,000 brake horsepower. The vessel will be capable of a speed of 15½ knots. Steam will be supplied at 250 pounds pressure by six oil-burning watertube boilers, at about 75 degrees superheat.

No efforts will be spared in making this vessel one of the most luxurious of the ships in coastwise service. Cabin arrangements allow for commodious lounge rooms, dining salons and promenade decks. She will be fitted to carry 237 first class passengers and 111 steerage passengers.

City of Los Angeles to Be Reconditioned

It is reported that the steamship *City of Los Angeles*, formerly the *Aeolus*, operated by the Los Angeles Steamship Company between West Coast ports and Honolulu, is to be reconditioned and fitted with new boilers and propelling machinery. Bids have been submitted on turbines for the vessel by various builders of marine engines. Prices have also been given on a single and double reduction gears by one of the gear manufacturers.

Captain Pillsbury, of Pillsbury & Curtis, San Francisco, Cal., is carrying on negotiations for boilers with oil burning equipment for this vessel. Work on the refitting of this vessel will necessarily include structural changes in the bunkers to accommodate them for carrying fuel oil.

O. Tug to Be Rebuilt

FORMATION has been received by MARINE ENGINEERING AND SHIPPING COMPANY that the Standard Oil Company of New York has decided to practically rebuild tug No. 1 of the New York fleet. The tug, which is 100 feet in length, will require new boilers.

American Marine Association Announces Plans for the Third Annual Exposition Nov. 5-10

THE American Marine Association will hold its Third Annual Marine Show in the Grand Central Palace, New York City, during Marine Week, November 5-10. This is the same week that the American Marine Congress will convene in New York, so that the combination of the two will beyond a doubt bring to New York the greatest marine gathering ever held anywhere in the world.

Practically every person interested in ship operation, building, repairing and allied lines will be present at that time, as the success of their business depends to a great measure on what is done by the Congress.

On the other hand, New York will be full of manufacturers, farmers, producers and shippers, who have things to ship in our vessels. They are coming with a view of bettering their business operation, namely, securing more profitable and advantageous ways of shipping their goods.

Much can be shown to these people by the marine fraternity, through the Marine Exposition.

This interest has never before been displayed in shipping affairs, so the committee in charge of the Marine Exposition this year feels that it has become in addition to its present function a matter of transportation in all its phases.

Transportation facilities will be highly developed in the Exposition; harbor, ports, terminals and shipping projects will be shown, together with all modern and economic handling facilities.

The committee in charge of the Exposition has been named and is as follows:

Edward A. Colson (chairman), chief operating engineer, Babcock and Wilcox Company.

J. Tiebout, Jr., Secretary, W. & J. Tiebout.

G. E. Lawrence, Sales Agent, Bethlehem Shipbuilding Corp.

R. C. Burnside, President, Asbestolith Mfg. Co.

C. Van Zandt, Gen. Mgr., Fire Detecting Wire Corp.

A. Schlueter, President, New Process Chemical Co.

F. W. Sterling, President, Sterling Cooper Corp.

P. S. Thorsen, President, P. S. Thorsen & Co.

Gardner Cornett, President, Pneumercator Co.

H. M. Lee, President, Lee and Simmons.

W. A. Reynolds, Field Engineer, Lunkenheimer Co.

H. Seip, New York Representative, Adams and Westlake Co.

G. E. Barker, Manager Eastern Zone, Crane Company.

R. B. Lea, Manager Marine Dept., Sperry Gyroscope Co.

John T. Borden, New York Manager, Sun Shipbuilding Co.

The chairman, Edward A. Colson, reports that already approximately 60 percent of the available exhibit space has been reserved.

Marine Congress to Foster Diesel Engine Development— Committee Organization Outlined

IN a recent interview with K. Warren Heinrich, secretary of the American Marine Association, which organization has called the American Marine Congress for November next, it was learned that one of the important activities of the Congress will be to determine upon effective ways and means of fostering Diesel engine development in this country.

To accomplish this end, a Diesel engine committee has been established, the chairman of which is Rear Admiral William S. Benson, U. S. N. (Retired), commissioner of the United States Shipping Board, Washington, D. C.

Admiral Benson is recognized as one of our foremost authorities on Diesel engine development, and he is noted for the unflagging interest he has always taken in the development of the motorship. Under his leadership it is confidently expected that the efforts of this committee will be most productive.

Admiral Benson has given much thought and study to an organization plan for such a committee, and it is learned that his proposed organization, as outlined here, has

met with the approval of those charged with the direction of the American Marine Congress:

CHAIRMAN: Rear Admiral W. S. Benson, U.S.N., (Retired), commissioner of U. S. Shipping Board.

EXECUTIVE SECRETARY: K. Warren Heinrich, secretary of American Marine Association.

GENERAL COMMITTEE: To include representatives of all the various fields of activities in the marine and stationary field of internal combustion engines, auxiliaries, and electrical appliances.

EXECUTIVE COMMITTEE: To include a few selected from the general committee and to be men actually engaged in the development of the industry and nationally known for their active interest in the matter.

The following is a list of the classifications of the various groups to be represented, together with the names of the various persons who have been selected for membership in this important committee. Some of those whose names are given have been extended invitations to accept places on this committee, and the others will receive their invitations as soon as they can be prepared and forwarded. In some cases the representatives of various companies have not yet been selected, and in those cases the name of the company is given, it being the

intention to confer with each company in question and have them designate their representatives:

GROUP (A) Manufacturers of marine Diesel engines: A. B. Homer, Bethlehem Shipbuilding Corporation; Max Rotter, Bush-Sulzer Bros., Diesel Engine Company; M. P. Fillingham, Falk Corporation; A. Ballin, McIntosh and Seymour Corporation; New London Ship and Engine Company; Wm. E. Groesbeck, New York Shipbuilding Corporation; Robert Haig, Sun Shipbuilding and Dry Dock Company; J. F. Metten, William Cramp and Sons Ship and Engine Building Company, and others.

GROUP (B) Manufacturers of small Diesel engines for propulsion or auxiliary purposes: Atlas Imperial Engine Company; G. H. Jernberg, Fairbanks, Morse and Company; S. B. Abrams, Ingersoll-Rand Company; H. G. Trout and Company; Knudson Motors; Mid-West Engine Company; Winton Engine Works; M. L. Katzenstein, Worthington Pump and Machinery Corporation; Union Gas Engine Company.

GROUP (C) Manufacturers of marine auxiliary and electrical equipment: G. H. Jett, Allan Cunningham Company; P. E. Kriebel, American Engineering Company; E. W. Niven, General Electric Company; F. L. Andrews, Hyde Windlass Company; Western Electric Company; W. E. Thau, Westinghouse Electric and Manufacturing Company; W. S. Wilkinson, Bethlehem Shipbuilding Corporation.

GROUP (D) Shipyards and ship repair plants: Bath Iron Works; Federal Shipbuilding Corporation; Louis R. Ford, Morse Dry Dock and Repair Company; J. F. Nichols, Newport News Shipbuilding and Dry Dock Company; New York Harbor Dry Docks Company; J. S. Milne, Todd Shipyards Corporation; Vulcan Iron Works; W. and A. Fletcher Company.

GROUP (E) Manufacturers of miscellaneous appliances specially applicable to motorships. (Note: No appointments to be made in this group at present.)

GROUP (F) Manufacturers of stationary Diesel engines: Nordberg Manufacturing Company.

GROUP (G) Ship operators: No representatives have been selected in this group, but it is understood that they will be selected from the following: Baltimore Steamship Company; C. H. Sprague and Son; Luckenbach Steamship Company; Mallory Transport Line, Munson Steamship Lines, Tampa Inter-Ocean Steamship Company. Standard Oil of New York, Standard Oil of New Jersey, United American Lines.

GROUP (H) Advisory Group: A. S. Hebble, Chief engineer of the Southern Pacific Company Lines, New York; Carl E. Peterson, naval architect, United States Lines, New York; Phillip Shore, president, Tampa Inter-Ocean Steamship Company, Tampa, Fla.

Full and complete information concerning the activities of this committee will be given from time to time by the press.

Morgan Yacht Corsair to Be an Oil Burner

WORK has just been commenced on the conversion of J. P. Morgan, Jr.'s, yacht *Corsair* as an oil burner, at the Tebo Yacht Basin Works, Brooklyn, N. Y., of the Todd Shipyards Corporation. The installation of new equipment and necessary structural changes will take about two months for completion.

The arrangement of coal bunkers in the *Corsair* is such that it will be necessary to tear down the present bulkheads and install oiltight bulkheads in their place, it being necessary to have three tanks on each side of the vessel to hold fuel oil for the cruising radius required.

BOILER EQUIPMENT

The yacht is fitted with two double end Scotch boilers with three furnaces each, so that twelve fuel oil burners will be used in the installation. The Todd system of fuel oil burning will be used. Additional equipment necessary to complete the work will be two duplex pumps and four fuel oil heaters.

The *Corsair*, when fitted for coal burning, made use of a closed stokehold with blowers located on the upper deck. Natural draft will be employed in the present installation.

Chief Executives of Six Cities to Serve on Delaware River District Committee of Coming Marine Congress

THE mayors of six cities have consented to serve on the Delaware river and Pennsylvania district committee of the American Marine Congress, to be held in New York, November 5-10, according to latest announcement. The district committee, the personnel of which is now virtually complete, is as follows:

Honorary Chairman, Hon. J. Hampton Moore, Mayor of Philadelphia, Pa.; district chairman, W. P. Smith, of the William Cramp & Sons Ship and Engine Building Company; Hon. Frederick W. Donnelly, Mayor of Trenton, N. J.; Hon. Victor King, Mayor of Camden, N. J.; Hon. William T. Ramsey, Mayor of Chester, Pa.; Hon. George W. K. Forrest, Mayor of Wilmington, Del.; Hon. William A. Magee, Mayor of Pittsburgh, Pa.; George F. Sproule, Director of Wharves, Docks and Ferries of Philadelphia; J. S. W. Holton, President, Philadelphia Maritime Exchange; Emil P. Albrecht, President, Philadelphia Bourse; Edward F. Henson, First Vice-President, Philadelphia Board of Trade; William R. Tucker, Secretary, Philadelphia Board of Trade; Charles P. Vaughan, President, Philadelphia Chamber of Commerce; J. H. Mull, President, William Cramp & Sons Ship and Engine Building Company; H. A. Magoun, Vice-President, New York Shipbuilding Company; E. M. Herr, President, Westinghouse Electric & Manufacturing Company; H. T. Herr, Vice-President, Westinghouse Electric & Manufacturing Company; John G. Pew, Presi-

dent, Sun Shipbuilding Company; H. B. Vansciver, Superintendent, Merchants & Miners Transportation Company; E. Lavino, President, Lavino Shipping Company; John Hazelhurst Mason, Chairman of the Board, Bank of North America; Gal-lowsay C. Morris, Vice-President, Insurance Company of North America; Charles E. Mather, of Mather & Company; S. M. Vauc-lain, President of the Baldwin Locomotive Works; James W. Rawle, President The J. G. Brill Company; W. J. Conlen, of Conlen, Acker, Manning & Brown; E. B. Hill, Vice-President, Bethlehem Shipbuilding Corporation; *W. G. Coxe, Vice-President-General Manager, Pusey & Jones Company; *Charles E. Davis, Jr., Manager Gailey, Davis & Company; *Charles Delaney, President, Kensington National Bank; *John Frederick Lewis, of Lewis Adler & Lewis. (Those indicated by * are considered practically certain of acceptance.)

STANDARDIZATION COMMITTEE

It is further announced that the Standardization Committee will be composed of the following men:

Captain R. D. Gatewood, chairman; A. E. Bouillon, Director of Simplified Practice Department of Commerce; E. H. Riggs, Naval Architect of the New York Shipbuilding Corporation; H. G. Smith, Vice-President, Bethlehem Shipbuilding Company; A. W. Whitney, Chairman, American Engineering Standards Committee; Captain C. A. McAllister, American Bureau of Shipping; William F. Gibbs, Naval Architect; C. F. Bailey, Engineering Director, Newport News Shipbuilding Company; William S. Brown, President, Marine Engineers' Beneficial Association.

OTHER ACCEPTANCES

Definite acceptance of the invitation to serve as chairman of the Great Lakes District Committee, covering Minnesota, Wisconsin, Michigan, Northern Illinois, Northern Indiana and Northern Ohio, has been received from F. C. Bradbury, of the Cra Company, Chicago, Ill. Similar action with regard to other committees has been given out as follows:

H. H. Raymond, President, the City Steamship Company, is chairman of the Coastwise Shipping Committee; Robert Alter, of the American Tool Works Company, Cincinnati, O., chairman of the Manufacturers' Committee; William H. Kell, of the Flower Lighterage Company, New York, chairman of the Towing & Lighterage Committee; Admiral William S. Benson, Washington, D. C., chairman of the Diesel Engine Committee; R. H. M. Robins, President, United American Lines, chairman of the Steamship Owners' & Operators Committee, and George Carey, Secretary, Omaha Chamber of Commerce, Omaha, Neb., chairman of the Agricultural Committee.

PLANS DEVELOPING

Rapid strides are reported in the work out of plans for the Congress, interest in forthcoming event having already become nation-wide. State, municipal and city bodies, in addition to national organizations throughout the country have signified their intention of taking an active part in the deliberations.

Offers Made for Purchase of the President Arthur

INFORMATION has been received that negotiations are under way for the purchase of the *President Arthur*, operated by the United States Lines, by the Los Angeles Steamship Company through Pillsbury & Curtis, San Francisco, Cal., acting as agents for the line. The *President Arthur* is desired to replace the *City of Honolulu*, recently burned, which was used in the service between Los Angeles and Honolulu.

If the negotiations are successful, the vessel will be reconditioned at a cost of approximately \$500,000. Of this sum \$250,000 will be spent in the boiler room in fitting new boilers and remodeling the coal bunkers for the carriage of fuel oil. It was decided to fit this vessel with oil burners when it was found that the coal bunkers could easily be changed to carry oil fuel.

The present boiler installation includes three single end and three double end Scotch boilers, which have been in service since the ship was built. It is understood that these will be replaced with boilers of the watertube type. It will also be necessary to fit new uptakes to the boilers and most of the present piping will have to be replaced to provide for the changes in the same generating plant. New condensers will also be installed.

In addition to the changes in the boiler and engine rooms, it will be necessary to completely recondition the third class passenger accommodations.

Ocean Shipping Improving; High Costs a Drawback

THAT the ocean shipping situation is improving is disclosed by recent reports of the Transportation Division of the Department of Commerce. It is difficult for ship operators, confronted with the task of making revenue from unusually low rates, to balance with, and perhaps exceed, operating costs, which are still high. Yet fundamental factors, the Commerce Department finds, have become more favorable during the last year.

In the 12 months ended June 30, 1923, the idle steam tonnage of the world declined 2,443,200 gross tons. Of this decrease 1,694,502 gross tons were put into employment during the first six months of this year. The fact that idle tonnage has declined more rapidly in the last half of the past 12 months indicates that the slowly improving overseas trade of the world is gaining momentum. Furthermore, ocean freight (trip charter) rates apparently reached bottom in the last quarter of 1922 at 109 percent of the average for 1913. In the first quarter of 1923 the index rose slightly to 109.8 and stood at 109.5 for the second quarter. While the increase is almost infinitesimal it is significant that there was an increase.

Idle tonnage in British ports decreased from 1,667,000 gross tons on July 1, 1922, to 1,063,500 gross tons on July 1, 1923, but increased 53,500 tons over the tie up tonnage on January 1, 1923. Greece and Australia show an increase in idle tonnage in their ports during the year. On the other hand, the idle fleet of the United States Shipping Board decreased by 155,000 gross tons, and the privately-owned American vessels out of employment on July 1, 1923, were approximately 55,000 gross tons less than on July 1, 1922. Japan, Denmark and Spain show a decline of over 50 percent in vessels tied up in their ports on July 1, 1923, as compared with the year ended July 1, 1922.

Admiral Line Plans Building New Coastwise Liner

IF reports from Seattle are true, the Admiral Line has had plans drawn for a new vessel for their coastwise passenger service. The ship will have accommodations for seventy more passengers than the steamer *Admiral Schley*, of the same line, and will have a speed of about 15 knots. It is said that if the plans for the construction are let, the proposed liner will be one of the finest afloat in the coastwise service anywhere in the world.

Bids for Derrick Boat Hulls

The U. S. Engineer Office, Louisville, Ky., will receive bids about September 25 for six steel derrick boat hulls, 34 feet by 16 feet. Alternate bids on two and on four hulls will be asked. The hulls will cost \$5,000 to \$15,000 each.

To Build New Equipment

Keystone Sand & Supply Company, of Pittsburgh, Pa., plans to spend nearly \$100,000 on new equipment, including one sand digger and one large all-steel tow-at.

Specifications Issued for One and Two Coastwise Ships for the Old Dominion Steamship Line

PLANS and specifications for the construction of one and two passenger and freight ships for the Old Dominion Steamship Line, of which H. B. Walker is president, have been issued from the office of Theodore E. Ferris, naval architect and marine engineer, and bids were received on August 27. It is believed that if two ships are built it will involve an expenditure of approximately three and a quarter million dollars.

The proposed vessels are to be of the 3-

deck, hurricane deck, coastwise type, 375 feet 6 inches in length by 53 feet beam, 20 feet 6 inches depth, with a draft of 17 feet 9 inches. Accommodations are to be provided for about 322 first-class passengers, 58 steerage (white and colored) and 289 immigrants. The ships, which will be about 2,100 deadweight carrying capacity, will be driven by turbine engines with reduction gears, steam being supplied by four Scotch boilers. The engines are to develop 4,750 shaft horsepower and all the auxiliaries are to be driven by steam.

Newport News Shipbuilding Co. Low Bidder for Construction of Two Type "B" Steamers for Clyde Line

THE Newport News Shipbuilding Company, of Newport News, Va., is the low bidder for the construction of two passenger and freight ships for the Clyde Line although no definite contract has been signed as yet, according to information obtained by MARINE ENGINEERING AND SHIPPING AGE. While no official announcement regarding prices has been made it is understood that the contract will involve slightly under two million dollars for each vessel, these figures being for the construction of the "B" type or smaller size steamer.

The "B" type ship, according to the specifications, which were prepared by Theodore E. Ferris, is to have a length overall of

402 feet, beam molded 54 feet, designed load draft 18 feet and a speed of 15 knots. This type of ship is also to have passenger capacity for between 252 and 306 first class and 86 steerage passengers.

Prices were submitted for two type "A" ships, each having a length overall of 425 feet 6 inches, driven by turbine engines, and two type "B" ships, equipped with either reciprocating or turbine propelling machinery.

Bids on the contract were received on July 23 and due to the absence of Clyde Line officials from the city no definite information could be obtained as to when a final contract would be signed.

Manitowoc Shipbuilding Corp. Awarded \$1,750,000 Contract for Construction of Two Steamers

THE contract for the construction of two new steamers for the Pere Marquette Railroad, to be used on Lake Michigan, has been signed with the Manitowoc Shipbuilding Corporation, at Manitowoc, Wis. Delivery of the first vessel is promised for March and the second to follow in four months, the outlay involving an expenditure of approximately \$1,750,000. When these two ships are completed the railroad's fleet on Lake Michigan will comprise seven vessels.

The specifications for the new steamers provide for an overall length of 360 feet, depth of hold 21 feet 6 inches, depth at center—main to shade deck—17 feet 7 inches, depth at side 17 feet 4 inches, draft 16 feet. The hulls will be of single bottom construction with six watertight bulkheads through the lower hold space and the bows will be cut away for use in ice. Construction will

be of steel with two complete decks, the main deck having four tracks and being capable of carrying twenty-six 42-foot cars. Accommodations for passengers and crew will be on the shade deck, the passenger staterooms being equipped with double berths.

PROPULSION

The steamers will be propelled by two vertical, triple expansion, direct acting, condensing engines turning twin propellers. Steam will be supplied by four Scotch boilers, equipped for burning coal under the Howden forced draft system. With the engine turning 92 revolutions per minute and three of the four boilers in use, the boats are to develop a speed of 14 knots under ordinary service conditions.

The steamers will be electrically lighted throughout, the auxiliary equipment including wireless telegraphy.

Shipping Board Gets Two Piers

The two piers at the Army Base at Norfolk, Va., have been turned over to the Shipping Board, by an executive order of President Harding. No agreement has been reached thus far which will permit the transfer of the property to the city of Nor-

folk, the city having made a bid for the purchase of the base.

The Shipping Board now has the two piers in its custody and it is understood that if the base is sold there will be an arrangement whereby Government owned ships may have the use of the docks and service from the Belt Railroads.

Bids Open Sept. 7 for Construction of Six Steel Barges

SEALD proposals for the construction and delivery of six steel barges will be received by the United States Engineer Office, 321 Custom House, Portland, Ore., until 10 A. M., September 7. The boats are each to be 120 feet long, of 34 feet beam and 7 feet 6 inches depth, delivery to be at the government moorings, Linton, Ore.

Each boat is to be equipped with eight 36-inch cleats and four 30-inch open chocks, all of cast steel and of approved design, and two hand capstans of American Engineering Company type.

Bids September 10 at Montgomery, Ala., for 6 Steel Barges

THE United States Engineer Office, of Montgomery, Ala., will receive bids until 11 A. M., September 10, for three steel barges 80 feet by 26 feet by 5 feet and three barges 60 feet by 22 feet by 4 feet. One of the 80-foot boats is for delivery at Mobile, Ala.; two at Apalachicola, and the three 60-foot barges are for delivery also at Apalachicola. The boats are to be built with transverse oiltight bulkheads.

One of the three 60-foot barges is to be used as a pile driver hull and one as a drilling barge, certain fittings being required for each.

Bids Sept. 11 on Proposed 19-Barge Building Program

AS previously announced the U. S. Engineer Office, at Louisville, Ky., plans the construction of nineteen steel barges. The time for receipt of bids has been set at 2 P. M., central time, on September 11. The proposed boats are to have a length of 110 feet, beam 26 feet, depth 6 feet 5 inches. Four of the boats are to be built without cargo boxes, 15 with cargo boxes, delivery to be at the locks of the Louisville and Portland Canal, Louisville, Ky.

The time allowed for completion, including delivery, is as follows:

19 barges.....	216 days
15 barges.....	240 days
14 barges.....	240 days
10 barges.....	220 days
9 barges.....	210 days
5 barges.....	200 days
4 barges.....	200 days

New Nautical College

A charter has been granted by the State Corporation Commission in Richmond, Va., to the United States Nautical College, Inc., of Norfolk, under which name the institution will operate. The institution will have as its purpose the education of students in the management of ships.

The school will train students in the fundamentals of ship operation. Captain William J. Blue has been named as president; Charles H. Drummond, secretary, and Ella Blue, as one of the incorporators. The maximum capital was placed at \$5,000 and the minimum at \$1,000.

Steamship Typhon to Be Converted as Motorship

THE steamship *Typhon*, owned by the United States Shipping Board, has been purchased by the O'Boyle Lightering Company, 15 Moore street, New York City. The most important feature in connection with this transaction is the fact that the vessel will be converted as a motorship, and is to be equipped with a 750 horsepower McIntosh & Seymour engine.

Changes in propelling machinery will necessitate considerable reconstruction. Plans and specifications for the work, now available, have been prepared by Whittlesey & Whittlesey, naval architects, New York City.

The vessel has a length of 250 feet, beam 43 feet, depth 24 feet, and is of 3,400 tons deadweight at a draft of 19 feet. When completed, the vessel is expected to do about 9 knots.

It is estimated that three months will be required to complete the work, which will cost approximately \$200,000.

To Build Barges and Elevator

It is learned that the West Kentucky Coal Company, of Sturgis, Ky., plans to build several 600-ton coal barges, 136 feet by 26 feet by 9 feet, at its shipyard at Dubuque, Ky. The same company is also considering a \$25,000 addition to its coal elevator at Dubuque.

TRADE PUBLICATIONS

COMBINATION GRINDER AND BUFFER.—A pamphlet giving the structural features of the combination grinder and buffer made by the Hisey-Wolf Machine Company, Cincinnati, O., is being sent to the trade. This machine is adapted to work requiring the use of a grinding wheel, buffer wheel, wire brush wheel or rotary wire rasp wheel.

SHIP LANTERNS.—A circular describing a combination lantern applicable to ship service has been sent out by the V. & N. Lantern Company, 256 Broadway, New York. This lantern, it is claimed, is useful as a riding light and deck lantern. It has a white and a red lens, the latter readily adjustable at any time and in any wind.

AMERICAN LIT-O-SIL-O.—The steamship *Leviathan* is decked with American Lit-O-Sil-O and the Marine Decking and Supply Company, Philadelphia, Pa., has made this latest outstanding installation of flooring the subject of a special *Leviathan* pamphlet. In addition to details and photographs of the decks of the *Leviathan*, general information on Lit-O-Sil-O is given.

BOILER TUBES.—An announcement of the New York boiler tube supply service of B. F. Keating Company, New York City, has recently gone out to the trade. Complete stocks of steel, lap welded and seamless charcoal iron tubes, as well as fittings, valves, cocks and plumbing supplies are maintained in the New York district. The card also includes a number of reference tables giving tube data.

ELECTRIC HOISTS.—A book of illustrated economies describing the application of the Shepard electric "Lift About" featuring the slogan "an electric hoist for everybody," has

been prepared by the Shepard Electric Crane and Hoist Company, Montour Falls, N. Y. to demonstrate that Shepard hoists are applicable to practically every industry. The book also contains specifications and structural details of the "Lift About."

MECHANICAL SYSTEM OF OIL BURNING. The system of oil burning known as the "Dahl System" controlled in this country by the Bethlehem Shipbuilding Corporation Ltd., Bethlehem, Pa., is outlined in a catalogue now being distributed. The swinging type furnace front is described in detail with illustrations, specifications, and its application. The catalogue also contains a description of the Bethlehem line of pumps for handling oil.

INDUCTION MOTORS.—The construction and application of Type A-A Reliance Induction motors for two and three phase alternating current circuits have been made the subject of a special bulletin by the Reliance Electric & Engineering Company, Cleveland, Ohio. The bulletin is introduced with a short outline of the company's history, leading to the manner in which type A-A motors were designed. Specific details of the motor construction are then given.

CONTROL RELAYS.—Control Relays, to be interposed between the circuit breaker solenoid and control switches are described in bulletin No. 47672 issued by the General Electric Company, Schenectady, N. Y. The relays described are known as the instantaneous control type PB-53 and the hesitating control, type PB-54. These relays are used for the remote control of circuit breakers when it is undesirable to have the control current pass through the control switch.

MODERN FURNACE BUILDING.—The Jointless Fire Brick Company, 9899 Clay Street, Chicago, is offering to engineers and power plant operators a booklet which tells the complete story of the building of modern lithic furnace linings. It shows how boiler furnaces, circular furnaces, pit type brick furnaces and other furnaces may be lined with this jointless furnace lining. Illustrations showing how forms for special shapes, like front door arches, are made are frequent.

SHOP TROLLEYS.—A trolley folder has just been issued covering the new Yale trolleys. It is the first piece of literature to be issued on this equipment, and contains, in addition to detailed descriptions of the plate and geared types of the new Yale steel plate roller bearing trolleys, a description of the new Yale cast-iron trolleys. Incorporated in it are details of interesting trolleys to which the new steel plate trolley was subjected, and a complete list of the material handling equipment manufactured by Yale & Towne Manufacturing Company, Stamford, Conn.

INJECTOR TROUBLES.—Many companies manufacturing equipment both for marine and stationary service devote considerable time to the investigation of the possible ways in which their equipment may be caused to function badly and to develop the best service and maintenance methods to prevent such difficulties. In the case of the Penberthy Injector Company, Detroit, Mich., many requests from engineers using the Penberthy injector asking for help in locating troubles caused this company to send out a data sheet giving "Directions for Locating Injector Troubles." It is quite the most complete work of its kind and will prove invaluable to any marine or plant engineer who includes injectors in his equipment. This company will send copies of the pamphlet on request.

Foreign Shipping and Shipbuilding Activities

Italian Liner Launched at Ansaldo Yard

GENOA, Italy (Special).—The latest addition to the fleet of the Transatlantica Italiana was recently launched in the shipyards of the Ansaldo Company at Sestri Ponente, just outside of Genoa. The new liner is named the *Admiral Bettolo*, after a famous Genoese sea captain, and was christened by the Countess Bettolo. There were present at the launching many civil and military authorities, and officials of the Transatlantica Italiana.

The *Admiral Bettolo* is the product of Italian labor and Italian enterprise, and her engines and entire equipment are Italian. She is the third liner which the Ansaldo Company has built for the Transatlantica Italiana. She will carry a total complement of 1,375 comprising 68 first class passengers, 114 third class passengers and 197 members of the crew.

The vessel is 447 feet long, displaces 1,600 tons, and will be capable of a speed of about 16 knots. She will be equipped with 22 lifeboats, one a motorboat, and with a radio outfit of the most modern type. There will be a complete heating and ventilating system, contrived to serve, specially, the hospitals, the third class dormitories, and the stokers' quarters.

The total capacity of the coal bunkers is about 1,880 tons, sufficient for a round trip from Genoa to New York. Among the other features of the equipment are an up-to-date refrigerating plant, and an electric plant.

The new liner will go into service between Italy and South America.

Ellerman Vessel Launched on the Tyne

WALLSEND-ON-TYNE, England.—Built for the Ellerman Lines, Ltd., of Liverpool, the *Lesbian*, a steel single screw steamer, was successfully launched by Swan, Hunter & Wigham Richardson, Ltd., from their Wallsend yard on July 31. The vessel is 71 feet 4 inches long, 41 feet 6 inches beam and 23 feet 9 inches depth forward and 22 feet aft. She has a cruiser-shaped stern, a combined poop and bridge about 172 feet 3 inches long, also a topgallant forecabin of 40 feet, and is rigged as a two-masted fore and aft schooner.

The ship is being built to the highest class of Lloyds, is designed to carry about 1,425 tons on a draft of about 21 feet 3 inches, has three cargo holds with four large hatchways leading to same and eight cargo derricks. Water ballast will be carried in the double bottom, all fore and aft, and in the after peak.

A steel house amidships provides accommodation for the saloon, chief officer, apprentices and stewards, and above this is a steel house with the captain's room and chart room. The engineers and remaining officers are berthed in steel houses abreast the engine casing, the seamen, firemen and petty officers in the forecabin.

The ship is lighted throughout by electricity, and the accommodation amidships is steam heated.

France Taking Steps to Improve Shipping; Committees Appointed to Suggest Ways; Shortage of Orders Handicaps Shipyards

By Our Paris Correspondent

THAT France is making strenuous efforts towards a general improvement of the conditions of her shipping trade is shown by recent examples such as the appointment of special committees for the mercantile marine, the measures taken by the Government and the resolutions passed by several congresses and various trade associations and Chambers of Commerce. Both the Government and these associations have been endeavoring for some months to stir up the general opinion in this country in favor of the development of the merchant marine by pointing out the vital importance of the shipping trade for France.

COMMITTEES APPOINTED

The Government has recently appointed a committee of leading personalities in the trade and shipping circles with a view to investigating the actual position of the French merchant marine and making suggestions towards bringing about an improvement in the present conditions of the maritime commerce. This committee, the so-called "Commission Generale Extra-Parlementaire de la Marine Marchande" (General Extra-Parliamentary Committee for Merchant Marine), has already made energetic efforts towards a better utilization of French vessels and a more favorable position of French shipowners as compared to foreign shipowners. The principal schemes and measures which are about to be enforced, thanks to the remarkable activity of the Commission Extra-Parlementaire, are: The organization of joint committees constituted by representatives of shipowners and seamen which is intended to prevent the occurrence of all possible differences between employers and employees such as the strike of September, 1922, which entailed severe inconvenience for the country and losses for shipowners; and the organization of the "Credit Maritime," a régime of loans to shipowners which shall enable the latter to hold out until the prevailing difficulties have disappeared. At the same time the Commission is importing measures in order to reduce the imports of foreign materials or fittings used for the construction of vessels, so as to organize a "self-supply" scheme.

Although the position of the steamship companies has so far not been much improved as shown by the reports for 1922, it

A vertical donkey boiler is fitted for supplying steam to the winches, windlass and other auxiliary machinery.

The engines, which are of the ordinary inverted marine type with three cranks driving a single propeller, also the boilers, of which there are two single-ended ones for a working pressure of 225 pounds per square inch, will be placed slightly abaft amidships and are being built by the Wallsend Slipway & Engineering Company, Ltd., Wallsend-on-Tyne.

is hoped that following the real and extensive efforts made on this side the shipping trade will shortly recover from its uneasiness.

LIQUIDATION OF STATE FLEET

The final accounts in respect of the liquidation of the State fleet have been recently set forth by Mr. Charles Leboucq, a deputy for Paris. While the sum produced by the sale of the vessels owned by the Government since the war amounts to 190 million francs the total expenditure comprising the cost of vessels and the running expenses works out to 1,998 million francs, the liabilities thus amounting to 1,808 millions. Assuming that the amount of interest for four years and various other expenses and duties may be estimated at 740 millions, the total amount of the liabilities amounts to nearly 2,500 million francs. Such figures which represent an enormous sum are far beyond the most pessimistic conjectures which have been put forward in recent years in that respect and it may be anticipated that France is not likely to make any further experiment with a State fleet.

Interesting signs of a slight improvement in trade conditions may be found in the recent decision taken by the French line to establish fortnightly departures (in lieu of monthly) from Havre to the northern and southern Pacific Coast of America.

SHIPBUILDING OUTLOOK

The position of the shipbuilding industry in this country is still showing severe difficulties owing to the shortage of orders for new vessels. Several shipyards, which were about to fail, have been able to carry on work, thanks to orders for warships placed by the Navy. Orders placed by private shipowners have been growing fewer and fewer in the course of the last month and it may be stated that the Messageries Maritimes is the only steamship company which has an important building program under completion. The reason for this is to be found in the fact that this company is receiving the financial support of the Government according to an agreement entered into in 1921.

A big event which has been arousing many comments in shipping circles during the last few weeks is the non-renewal of the commercial "modus vivendi" which had been entered into between France and Portugal in order to establish special low rates for the customs duties in respect of goods imported from one country to the other. The measure was suggested by the French Minister of Agriculture with a view to protecting the interests of the wine-growers of Southern France by opposing the import of Portugal wines. Such development will cause a heavy prejudice to French shipowners by reducing or suppressing the return freight which was taken in Portuguese ports by their vessels on their homeward voyages from North Africa.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Tug Drydocked, Portland, Ore.—The tug Wallula has been lifted on the Portland drydock preliminary to her transfer to the Hammond Lumber Company.

Ship Work, San Francisco, Cal.—The General Engineering Company is very busy with miscellaneous ship work, including the steamer West Henshaw.

Steamer Drydocked, Cleveland, Ohio.—The steamer W. A. Rogers has been drydocked for repairs to twenty-seven damaged plates received as a result of grounding.

Plate Repairs, Etc., Cleveland, Ohio.—The barge I. L. Bell, which recently had her plates damaged and considerable internal damage as well, has been drydocked for repairs.

Steamer Reconditioning, Philadelphia, Pa.—The steamship Western Spirit was awarded by the Shipping Board to the Cramp Shipbuilding and Dry Dock Company for reconditioning.

Barge Contract Awarded, Fort Mason, Cal.—The Quartermaster, United States Army, Fort Mason, Cal., has awarded the contract for a wood barge to A. W. DeYoung, at a price of \$17,250.

Conversion to Oil, Staten Island.—The steamship Kermit, of the United American Lines, is being converted from a coal to an oil burner at the plant of the Staten Island Shipbuilding Company.

Power Boat Repairs, Baltimore, Md.—The power boat, W. J. Townsend, which recently received damage to her propeller and stern bearings, has been taken to the Woodall's shipyard for repairs.

Vessel Repairs, New Jersey.—The contract for general hull and machinery repairs to the steamship West Comak was awarded on August 7 to the Federal Shipbuilding Company, at a price of \$21,235.

Steamer Overhauling, Mobile, Ala.—The steamship Cabrille has been hauled out on the docks of the Alabama Drydock and Shipbuilding Company for hull repairs and also some boiler and auxiliary work.

Dredge Reconditioning, Charleston, S. C.—The Charleston Dry Dock and Machine Company has started work on the United States dredge Comstock, which consists of scraping and painting the bottom.

Steamship Overhauling, Boston, Mass.—The Atlantic Works, East Boston, has been awarded the contract for overhauling the steamer Wabash, of the Nawsco Lines. The work will occupy thirty days and cost \$16,356.

Annual Overhauling, West Coast.—The coastwise passenger and freight fleet of the Pacific Steamship Company will receive its annual overhauling, the work having been started with the reconditioning of the liner Admiral Schley.

Stern Frame Replacement, Oakland, Cal.—The Moore Drydock Company received the contract for replacing a broken stern frame on the Norwegian steamer Lulse Niesen, the work to cover a period of about twenty-two days. Price \$18,454.

Vessel Repairs, New York.—At the opening of tenders for damage and bottom repairs to the steamship City of Freeport, of the Tankers Corporation, on Wednesday, August 8, the Alderton Dry Docks, with a bid of \$10,500, received the contract for the work.

Wooden Scows, Nassau.—The Government of the Bahamas invites tenders for the construction of

two wooden dump scows, having a capacity of 800 cubic yards. Plans and specifications may be obtained from S. R. H. Beard, harbor engineer at Nassau.

Vessel Repairs, New York.—The contract for general repairs and betterments on the steamship Southern Cross has been awarded to the Morse Dry Dock & Repair Company at a price of \$22,000, following the opening of bids by the Shipping Board on August 8.

Seasonal Drydocking, Charleston, S. C.—The steamship Cliffwood has been taken to the drydock of the Charleston Dry Dock and Machine Company and the steamship Cody is expected on the docks in the very near future.

Steamship Survey, Oakland, Cal.—Survey of the French Line steamer Alaska, damaged recently in collision, has been made by the Moore Drydock Company, of Oakland, and it was found that the vessel will need a new stem, renewal of some frames and about twenty new plates.

Extensive Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been awarded changes and repairs on the Mexican steamer Korrigan III.; river boat San Joaquin, general repairs, and the tug Sea Queen, of the Red Stack fleet, for propeller installation.

Miscellaneous Work, Oakland, Cal.—The Moore Company is also working on the following contracts: Renewal of six furnaces in the boilers of the tanker San Joaquin, after which the vessel will be drydocked, and drawing the tailshaft and carrying out hull repairs on the steamer Isonomia.

Low Bidders, Derrick Hull, Mobile, Ala.—The Midland Barge Company, of Midland, Pa., with a bid of \$21,900, submitted the lowest price for the construction of a steel derrick boat hull, bids for which were received by the United States Engineer Office, at Mobile, Ala., on Monday, August 6.

Scows Ordered, Louisville, Ky.—The contract for the construction of six steel side dump scows, bids for which were opened by the United States Engineer Office at Louisville, Ky., on July 16, has been awarded the Dravo Contracting Company, of Pittsburgh, Pa. The Dravo Company's total bids for the boats was \$113,220.

Vessel Conversion, Baltimore, Md.—The Bethlehem Shipbuilding Corporation of Baltimore, Md., has been awarded the contracts for reconditioning the steamers Mount Carroll and Mount Clinton from passenger to freight carriers for the United American Lines, the price for each steamer being approximately \$32,725.

Low Bidder, San Francisco, Cal.—The General Engineering and Dry Dock Company submitted the lowest tender at the opening of bids for hull repairs to the steamer West Cactus, with a tender of \$959. The other bids were: Moore, \$975; Bethlehem, \$998; Crowley, \$1,270; United Engineering Works, \$2,081, and Smith & Scanlon, \$2,197.

Tanker Repairs, New York, N. Y.—The tank steamer Bethelridge, operated by the firm of Walker & Daly, has been awarded to the Clinton Dry Dock & Repair Company for drydocking, painting and bottom repairs, to cost about \$2,280. A contract on the same vessel was recently completed by the Atlantic Basin Works, totaling about \$2,800.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation, San Francisco, Cal., has received the following contracts: The Norwegian steamer Sinaloa, of the Latin-American Line, for inspection; State tug Governor Irwin, for extensive hull repairs; British tanker Placuna and tanker La Purisma, for miscellaneous repairs.

Shipyard Activities, Baltimore, Md.—The Bethlehem Shipbuilding Corporation has been awarded

the contract for repairs to the steamer West Arrow by the Shipping Board at a price of \$5,800. The steamship Morrirstown is on the Baltimore Dry Docks and the Maryland Dry Dock Company is completing repairs on the steamship West Isleta.

Derrick Boats Planned, Rock Island, Ill.—The Chief of Engineers, U. S. Army, has authorized the U. S. Engineer Office, at Rock Island, Ill., to have constructed two steel hull derrick boats, to be 7 feet long by 34 feet beam and 5 feet deep, each boat to have two watertight bulkheads and two spud wells. It is understood that bids will be canvassed shortly.

Bids for Pumps, New York.—Sealed proposals were received by the Superintendent of Lighthouses, Third District, Staten Island, New York, on August 16, for furnishing and delivering a 3-inch by 2-inch by 3-inch horizontal duplex fresh water pump. This pump is to replace a pump of similar size and the new pump must replace old one without alteration to present piping or foundation.

Drydocking Job, New York.—The toss of a coin decided the awarding of a drydocking job on the steamship Prusa, following the recent opening of bids by the Shipping Board. The Morse, Robinson, New York Harbor, Crane and Staten Island Shipbuilding Companies each bid \$255.65 for the work the Fletcher yard tender being \$300. On the "throw-off" the Crane Company took the job.

Steamer Launched, Newport News, Va.—The steamer City of Chattanooga was recently launched from the yards of the Newport News Shipbuilding and Dry Dock Company. The vessel is for the Ocean Steamship Company and is a 6,500-ton ship 400 feet in length. She will run between Savannah, Ga., and New York. Her sister ship, the City of New York, is now on the ways and will soon be launched.

Low Bidder for Derrick, Huntington, W. Va.—At the opening of tenders by the United States Engineer Office, Huntington, W. Va., on August 16, the Dravo Contracting Company, of Pittsburgh, Pa. was low bidder for furnishing and delivering a steel derrickboat for the Kanawha River. The proposal were: Dravo Contracting Co., \$25,870; Charles War Eng. Works, \$26,760; Penn Bridge Co., \$28,500; Midland Barge Co., \$29,700; Independent Bridge Co., \$31,000.

Oil Barge, New York.—Plans and specification for the construction of a 5,000-barrel steel oil barge for the New York Central Railroad have been issued from the office of J. W. Millard, 17 State street, New York City. Bids were received at the uptown office of the New York Central on August 23. The proposed vessel is to be 144 feet long, beam 22 feet, depth 11 feet. It is understood that the equipment will include the "R. & D." heating system.

Miscellaneous Repairs, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, Mobile has been awarded the following contracts: Towbon Demopolis, engine overhauling, etc.; tug Pinquon for hull scraping and painting machinery and boiler work; steamship Normania, boiler work; tug Buzzard, electric welding and other boiler repairs; tug Nimrod, installing of two fuel oil tanks, etc.; and tug Marion, placing of new steel decking and various other repairs.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been awarded the following work: Standard Oil tanker Captain A. F. Lucas, general repairs; oil carrier William H. Doheny, general cleaning, painting and miscellaneous work; British tanker Placuna, of the Anglo-Saxon Petroleum Company, placing of rivets in the hull; American-Hawaiian carrier Oregonian extensive general repairs; the Arizonian, extensive reconditioning.

Pump for Standard Oil Barge.—The Northern Fire Apparatus Company, of Minneapolis, has received

he contract for rotary pump equipment on the new diesel-electric barge under contract with the Newport News Shipbuilding & Dry Dock Company for the Standard Oil Company of New Jersey. The boat will be the first on the Atlantic coast with almost complete rotary pump equipment. There will be three cargo and four auxiliary pumps, direct connected to Westinghouse motors.

Vessel Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation, of San Francisco, Cal., submitted the lowest tender for drydocking and repairing the United States Shipping Board steamer West Calera. The price bid for drydocking the vessel was \$1,700 and \$17,638 for repairs, with the highest bid for the repairs running approximately \$21,000. The West Calera is one of the five freighters being placed in spot condition by the Government, these vessels having been brought to San Francisco from Southampton Bay on the West coast.

Miscellaneous Repairs, Mobile, Ala.—The Alabama Drydock and Shipbuilding Company has also been awarded the following miscellaneous work: steamship Hulaco for repairs to machinery, overhauling and assembling of refrigerating machine, boiler work, etc.; the tug Marion for renewal of a number of bulwark plates and various other plates; steamship Gaston for drydocking, cleaning and painting and some propeller and engine work; reconditioning of the steamer Cattleya and the Texas company's steamship Louisiana, for examination of hull and scraping and painting.

Vessel Repairs, New York.—Recent contracts awarded the New York Harbor Dry Dock Company include: The Standard Oil tanker Somerset, the Export Steamship Company's steamship West Gotomka, the Norton Lilly steamship City of Madrid, the White Star steamship Gitano, the Tidewater Oil barge Tydol, and two Merritt, Chapman & Scott derricks. Bids submitted on the Somerset were: New York Harbor, \$11,899; Robins, \$12,656; Staten Island Shipbuilding Company, \$14,661. On the steamship West Gotomka the proposals were: New York Harbor, \$6,972; W. & A. Fletcher, \$6,900; Alderton, \$7,300; Shewan, \$7,500; Clinton, \$7,514; Morse, \$7,694; Crane, \$7,827.

Bids for Derrick Boats, Nashville, Tenn.—The Union Bridge Company, of Beaver Falls, Pa., with a price of \$58,900, was the low bidder for the construction of two derrick boats with derricks, at the opening of proposals by the United States Engineer Office, at Nashville, Tenn., on August 13. The proposed vessels are to have a length of 76 feet 6 inches, beam 34 feet, depth molded at gunwales 5 feet, the hulls to be built of steel, each having two transverse watertight bulkheads. The tenders submitted for the work were as follows: Penn Bridge Co., \$58,900; Midland Barge Co., \$64,000; Independent Bridge Co., \$67,900; Dravo Contracting Co., \$71,750; Nashville Bridge Co., \$89,940.

Vessel Reconditioning, San Francisco, Cal.—At the opening of tenders for the reconditioning of three vessels, the General Engineering and Drydock Company, of San Francisco, Cal., submitted the lowest bids. For the installation of an oil burning system on the Mexican Navigation steamers Washington and Bolivian, the prices submitted being for each ship, the bids were as follows: General Engineering, \$10,865; Hanlon, \$12,675; Main Iron Works, \$14,339; Moore Drydocks, \$19,750; Bethlehem Ship. Corp., \$21,465. The third bid was on the steamer West Henshaw, one of the five vessels withdrawn from the idle Shipping Board fleet to be put in "spot" condition. The following were the prices: General Engineering, \$17,505; Main Iron Works, \$17,965; Crowley Ship Co., \$21,311; United Engineering, \$21,735; Hanlon, \$21,820; Bethlehem Ship. Corp., \$22,591; Moore Drydocks, \$24,170.

SHIPYARDS AND DRY DOCKS

Shipyard Purchased, Seattle, Wash.—The Pacific Steamship Company has completed a purchasing deal of 25½ acres of the wartime shipyard of the Skinner & Eddy Corporation, known as the No. 1 plant, and will construct terminals for ocean shipping which will cost several million dollars. The plans provide for three large piers, warehouses of large capacity and a building for the general offices of the Pacific Steamship Company.

Merchant Yard Closed, Chester, Pa.—On September 1 the Merchant Shipbuilding Company's yard on

the Delaware River will be closed down permanently, due to the dullness in the shipbuilding industry and the determination of the Harriman interests to concentrate all their efforts in that line at the Cramp Yards, at Philadelphia. When the yard was first owned by John Roach the first four steel ships of the modern American navy were built, the Atlanta, Boston, Concord and Dolphin.

PORT IMPROVEMENTS

Coal Elevator, Paducah, Ky.—West Kentucky Coal Company, Sturgis, plans a coal elevator at the foot of Ohio street, here. \$25,000.

Grain Elevator, Louisville, Ky.—R. D. Reidling, 18th and Magnolia streets, plans rebuilding grain elevator recently destroyed by fire. \$40,000.

Seawalls, West Palm Beach, Fla.—An election was held on August 14 for the purpose of voting on \$100,000 bonds for seawalls. K. Riddle, city manager.

Contract Rescinded, Sanford, Fla.—The city of Sanford rescinded the contract for a pier and yacht basin. Will re-advertise. F. T. Williams, Sanford, engineer.

Canals, Caledonia, Minn.—Plans are being prepared for 4,700 lineal foot canals to take care of flood waters of Mouse River. \$266,250. W. W. Peterson, city engineer.

Harbor Improvements, Oshawa, Ont.—The Dominion Government, Ottawa, voted \$50,000 for harbor improvements here, hydraulic dredge work. K. M. Cameron, chief engineer.

Grain Elevator, Edmonton, Alta.—The Department of Public Works, Railways and Canals, Ottawa, plans grain elevator here, \$200,000. K. M. Cameron, acting chief engineer, Public Works.

Pier, Charleston, S. C.—Sealed proposals will be received by the Port Utilities Commission, Room 712, Peoples Building, for construction of Union Pier. H. M. Gallagher, general manager.

Grain Elevator, Halifax, N. S.—The Department of Public Works, Railways and Canals, Ottawa, plans a grain elevator here, \$200,000. K. M. Cameron, acting chief engineer, Public Works.

Contract Placed, Ottumwa, Ia.—Wapello County awarded the contract for a drainage ditch and improvements in Cedar Creek Drainage District to Rude & Wold, Pomeroy, at a price of \$35,281.44.

Wharf, Blind River, Ont.—The Department of Public Works, Ottawa, awarded the contract for reconstructing timber wharf, pile foundations, to T. P. Charleson, 179 Gilmour street, Ottawa, \$25,000.

Drainage Canals, Levees, etc., Rayville, La.—Tensas Basin Levee Association plans to build 75-mile drainage canals, levees, etc., to protect 1,250,000 acres in northeastern section of state. \$3,500,000.

Hydraulic Dredging, Sault Ste. Marie, Ont.—The Department of Public Works, Parliament Buildings, Ottawa, plans hydraulic dredge work in harbor here. \$60,000 bonds voted. K. M. Cameron, chief engineer.

Pier, Hamilton Beach, Ont.—The Department of Public Works, Parliament Building, Ottawa, voted \$50,000 bonds for pier (mostly wood construction) at Hamilton Beach. K. M. Cameron, chief engineer.

Landing and Facade, New Orleans, La.—The Board of Port Commissioners, New Court Building, will take bids about October for extending the Poland Street wharf, 400 feet long and 230 feet wide.

Pier, San Diego, Cal.—The City Council awarded the contract for Contract B, on Municipal Pier 2, comprising concrete apron wharf for mole type pier, to F. H. Doran, 3735 Seventh street, at a price of \$292,700.

Levee, Caledonia, Minn.—Houston County Drainage & Conservancy District 1, plans levee and pumping station. \$428,000. Central States Engineering Company, 602 Laurel Building, Muscatine, Iowa, engineers.

Grain Elevator, Tiffin, Ont.—The contract for a 2,500,000-bushel elevator at Tiffin has been awarded to Fegles Construction Company, Fort William, by the Canadian National Railroad Company, 230 St. James street, Montreal, Que.

Levee, Bridge Junction, Ark.—Sealed proposals were received on August 15 by the St. Francis Levee Board for 32,000 cubic yards of excavation in ditch construction work adjacent to levee in Lee County. H. N. Pharr, chief engineer.

Elevator, Vancouver, B. C.—Harbor Commissioners, 712 Pender street, West, awarded the contract for superstructure of addition to Elevator No. 1, reinforced concrete, to Pacific Construction Company, Ltd., foot of Salisbury Drive, \$350,000.

Grain Terminal Improvements, San Francisco, Cal.—The Board of Harbor Commissioners has approved of the letting of contracts calling for various improvements at the State Grain Terminal located at Islais Creek, aggregating \$23,600.

Shipping Platform, Pittsburgh, Pa.—H. H. Heinz Company, 1062 Main street, is having plans prepared by Hunting & Davis, engineers, Century Building, 2 and 3 story, 25 by 500 feet reinforced-concrete and steel shipping platform, Progress street. \$175,000.

Grain Elevator, Vancouver, B. C.—Harbor commissioners, 712 Pender street, West, awarded the contract for a super-structure and foundation for Elevator No. 2, reinforced concrete, to Northern Construction Company, 736 Granville street, \$1,450,000 and \$150,000 respectively.

Levee, Clarksdale, Miss.—The Board of Levee Commissioners, Yazoo Mississippi Delta, received sealed proposals on August 14 for enlarging 5-mile Ward Lake Levee containing 10,000 cubic yards of topping and 75,000 cubic yards of banquette enlargement. W. L. Head, chief engineer.

Coal Elevator, South Beloit (Beloit, Wis., P. O.), Ill.—Keeler Lumber and Fuel Company, 108 State street, Beloit, Wis., awarded the contract for a 60 by 100-foot reinforced-concrete and timber coal elevator, 36 feet high, here, to J. Cliff, Bluff street, Beloit, Wis. Engineer's estimate, \$30,000.

Canal Drainage, Senatobia, Miss.—Strahorn Creek Drainage District, Tate County, has awarded the contract for 12½ miles drainage of canals, including 410,680 cubic yards in main canal and 110,000 cubic yard laterals, to Canal Construction Company, McCall street, Memphis, Tenn., at a price of \$0.975 per cubic yard.

Contract Awarded, Vicksburg, Miss.—The contract for 4,200 lineal feet of sea wall containing 9,500 cubic yards of concrete, 450 tons of reinforcing steel, 4,200 feet of interlock sheet piling 10-20 feet long, has been awarded to Jefferson Construction Company, Q & C Block, New Orleans, La. Engineer's estimate, \$325,000.

Bulkhead, Indian River City, Fla.—Indian River City Town Site Corporation is having plans prepared for a 3,000-foot bulkhead, 400 feet out from meander line of Indian River, and a 600-foot causeway to connect with artificial island of about 5 acres, \$150,000. H. F. Williams, care Hotel Pines, Titusville, manager.

Harbor Improvements, etc., Ontario, Can.—The Department of Public Works, Parliament Buildings, Ottawa, plans harbor improvements at Port Stanley, \$50,000; Toronto, \$600,000; Fort Williams, \$192,000; wharf extensions at Pelee Island, \$31,000; wharf repairs at Windsor, \$3,500; Port Burwell, \$2,500. K. M. Cameron, acting chief engineer.

Dredging, New Jersey.—Sealed proposals were received on August 15 at the office of the Department of Commerce & Navigation, Trenton, for dredging a section of proposed inland waterway connecting Barnegat Bay with Manasquan River, Ocean County, at \$55,000. H. J. Sherman, engineer. V. Gelineau, State House, Trenton, director.

Dredging, Boston, Mass.—The United States engineer office received bids on August 30 for dredging in Beverly Harbor, Mass. The total estimated quantity of material necessary to be removed, exclusive of allowable overdepth, is 512,803 cubic yards; the maximum amount of allowable overdepth being estimated at 96,940 cubic yards.

Bonds for State Port, Georgia.—A bill providing for the issuance of \$15,000,000 in bonds for the creation of a state port at some point to be voted on by the people of Georgia was introduced in the

house of representatives recently. The bill provides for a vote of the people on the issuance of the bonds and also an election as to the best location for the port.

Port Surveys.—A survey of the ports of this country is being made jointly by the Shipping Board and the Board of Engineers. At present a complete survey of the Port of Norfolk and its terminal facilities is being made by Oliver Albert Reynolds, examiner of ports and terminals for the United States Shipping Board and the United States Board of Engineers for rivers and harbors.

Steel Structure, New Orleans, La.—The Board of Commissioners at the Port of New Orleans received sealed proposals at Suite 200, New Orleans Court Building, on August 16, for furnishing and erecting a steel structure complete for a straw warehouse at the Desire Street landing. Bids were taken separately for fill, concrete floor, etc., and for the structure above the foundations and for the entire work. Requisition E. D.—13752.

Terminal Enlargement, Norfolk, Va.—The Norfolk City Port Commission has been discussing the necessity for taking up the plans for the construction of the proposed west gallery on the municipal grain elevator, in order to handle the business which is now moving through these terminals. The east gallery is now being built by A. M. Crain & Company, the builders of the elevator. The plans and specifications for the west gallery have been drawn, and the work is estimated to cost in the neighborhood of \$175,000. The commission also has discussed the possibility of being compelled in a short time to erect an additional storage unit of from 500,000 to 1,000,000 bushels capacity.

GOVERNMENT WORK

Dredging, Galveston, Tex. U. S. Engineer, Galveston, plans dredging in Houston Ship Channel. L. M. Adams, district engineer.

Dredges, Louisville, Ky.—U. S. Engineer, P. O. Box 72, will soon take bids for two steel hull dipper dredges 2½ to 4 cubic yards capacity.

Dredging, San Diego, Cal.—Specification 4885. The Bureau of Yards and Docks, Navy Department, Washington, D. C., plans dredging here.

Dredging, Norwalk, Conn.—Sealed proposals were received at the office of the U. S. Engineer, Providence, R. I., on August 22 for dredging in Norwalk Harbor.

Lock Construction, Pittsburgh, Pa.—The U. S. Engineer Office, Pittsburgh, received sealed proposals on August 23 for constructing new Lock No. 7, Monongahela River.

Dredging, Milwaukee, Wis.—Contract for dredging various rivers and channels during the season have been awarded to Great Lakes Dredging & Dock Company, 216 West Water street, \$0.364 per cubic yard, total \$31,500.

Dredging, New York, N. Y.—U. S. Engineer Office, 2nd District, Army Building, awarded the contract for removing St. George Shoal, New York and New Jersey Channels, to G. H. Breyman & Brothers, 17 Battery place, at \$7,200.

Stone Riprap, Harbor Beach, Mich.—Sealed proposals were received at the United States Engineer Office, Detroit, Mich., on August 16 for furnishing and placing, and for recovering and replacing stone riprap at Harbor Beach, Mich.

Dredging, Etc., Buffalo, N. Y.—Bids will be asked for in a short time by the U. S. Engineer Office, Federal Building, Buffalo, for dredging and rock excavation in the Black Rock Canal, Buffalo, approximate cost to be \$250,000.

Pumps, New Orleans, La.—The contract for furnishing two 20-inch dredge pumps to U. S. Engineer Office, 329 Custom House, has been awarded to Ellicott Machine Corporation, Bush and Severn streets, Baltimore, Md. \$11,200.

Tanks, Memphis, Tenn.—U. S. Engineer Office, Mississippi River Dredging District, P. O. Box 1017, awarded the contract for two 20,000-barrel fuel oil tanks, at U. S. Dredge Depot, here, to Walsh & Weldner Boiler Company, Main and Sycamore streets, Chattanooga, \$26,494.

Contract Awarded, Louisville, Ky.—U. S. Engineer Office, P. O. Box 72, awarded the contract for a deep well centrifugal pump, double stroke, 8-inch drop pipe, for Dam 44, to Belknap Hardware & Manufacturing Company, 2nd and Washington streets. \$2,230.

Lumber, Louisville, Ky.—The contract for furnishing yellow pine No. 1 common, 1,300 pieces, 6 by 8 inches by 20 feet; 250 pieces 4 by 6 inches by 20 feet, 120 pieces 2 by 4 inches by 10 feet, etc., to U. S. Engineer Office, Louisville, has been awarded to King Sparrow Lumber Company, Hattiesburg, Miss. \$32 per M feet.

Grain Elevator, Montreal, Que.—Montreal Harbor Commissioners will build Tarte Pier grain elevator by day labor. First unit 2,000,000-bushel capacity reinforced-concrete, structural steel marine towers, track sheds, receiving house and shipping houses, \$2,347,000. J. S. Metcalfe Company, Ltd., 54 St. Francois Xavier street, architects.

Repairs, Philadelphia, Pa.—Sealed proposals were received on August 28 by J. M. Hoffman, Division of Docks and Wharves, Navy Building, Washington, D. C., for repairs to substructure and deck of portions of Piers 97, 98 and 99, Philadelphia Army Supply Base, foot of Oregon avenue, Philadelphia, for the United States Shipping Board.

Steel Booms, Pilcher, Ky.—Sealed proposals were received by the United States Engineer Office, Room 423, Customhouse, Louisville, Ky., on August 27, for furnishing and delivering two steel booms, 67 feet long complete with 22-inch sheaves, etc., delivery to be c/o U. S. Government Engineer, c/o Dam 44, Ohio River, U. S. Siding, Pilcher, Ky., a station on the L. H. and St. L. R. R.

NEW INCORPORATIONS

The Callaghan Transportation Corporation, capital \$100,000, chartered under Delaware laws.

The Bison Steamship Corporation, of Tonawanda, N. Y., capital \$150,000, chartered at Albany. Incorporators: J. J. and M. O'Hagan and J. Gehm.

The Morecraft Transportation Corporation, of Wilmington, Del., capital \$500,000, incorporated under Delaware laws, to engage in the operation of boats.

The Pacific Mail Corporation, capital \$1,000,000, incorporated under Delaware laws. Incorporators: F. M. Stokes, of Woodhaven, L. I.; Joseph F. Mann, of Bloomfield, N. J., and William D. Ahearn, of Brooklyn.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
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Collegio Degli Ingegneri Naval e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

October, 1923

Number 10

Published Monthly by
ALDRICH PUBLISHING COMPANY

In Conjunction With
SIMMONS-BOARDMAN PUBLISHING COMPANY
30 Church Street, New York

JAMES SWAN } Editors
H. H. BROWN }

L. S. BLODGETT, Associate Editor

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MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), National Association of Periodical Publishers, Inc., New York Business Publishers' Association and the Audit Bureau of Circulation (A. B. C.).

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A Solution for the Shipping Problem

THE decision of the Attorney General of the United States, regarding the so-called Lasker-Farley plan for the disposition of the Government-owned merchant vessels, has left the Shipping Board once more at sea, exactly where it has been floundering most of the time since Congress refused to pass the ship subsidy bill. Mr. Daugherty's opinion was that the unloading of Government merchant ships on numerous private corporations in which Uncle Sam would be a considerable stockholder and, incidentally the holder of the proverbial bag, would be illegal, consequently, the Lasker-Farley plan has become a dead issue and the Shipping Board must devise some other scheme for solving its vexing problem.

What can be done?

The present method of indirect operation is both unsatisfactory and costly. The loss to the Government is at the rate of \$50,000,000 a year. Moreover, Section I of the Jones Act seems not only to preclude continuous Government ownership but actually to demand that the Shipping Board vessels be sold to private owners.

The approximate value of each and everyone of these vessels is known as a result of the careful and competent survey of all Government-owned merchant ships which has recently been made. Many of the ships are commercially worthless and must therefore be scrapped. There are several responsible concerns, however, which are ready to buy certain ships and routes and, if the Government assumes a business-

like attitude and agrees to terms that are fair to both sides, customers can be found for the others.

To ask a prospective buyer to pay a definite price for an article of questionable value is certainly unfair to the customer and it cannot be denied that some of the steamship routes established by the Government, if not the vessels themselves, are of questionable value. Nor is it right for the Government to turn its property over to private citizens without remuneration and proper protection against loss, but it is conceivable that it would be cheaper in the end to give away as an investment those routes and vessels which are actually of questionable value rather than to continue the present method of Government ownership and semi-Government operation, especially when instances are known where ten ships have been turned over to agents to make possible the continuous operation of five!

The formula that seems to us the solution of the whole problem was given in the editorial "Why Government Ownership?" published on page 387 of our July issue. This reads as follows: "First scrap all ships that cannot possibly be sold because unfit for profitable operation; they are in any event as much of a menace to the progress of the American merchant marine as are derelicts to navigation. Then sell all of the others to private owners either after first installing Diesel engines and in other ways refitting for competitive business such of the vessels as would be amenable to that treatment, or else authorizing the purchaser to do so, the job to be financed by the Government."

To those corporations of American citizens which indicate that they are willing to purchase such vessels or routes, terms of payment that they can meet should be granted. Moreover, the prices charged for the vessels, as well as for the routes, should be in proportion to their respective capital values and their possible earning power. In the event that these values are not known or cannot be determined with any reasonable degree of certainty in advance, an upset minimum based on the worth of the ships alone could be filed, the question of possible additional compensation to be determined after a given period of actual operation on stipulated routes under private ownership.

If this plan were put into effect, the result would be the elimination of a Government expense of at least \$50,000,000 a year and the return to the Treasury of some part of the cost of the ships. At the same time, a new lease of life would be given to the American merchant marine as a whole and a new hope to that great industry which has to do with the building, repairing and equipping of ships.

Revision of Our Maritime Laws Should Be Speeded Up

ONE thorn in the side of the American merchant marine should be speedily removed, and that is the antiquated rules and regulations under which Federal inspection of vessels is conducted. Not only are the present rules and regulations antiquated, but often they are confusing and difficult of uniform and fixed interpretation. Moreover they frequently overlap the rules of the ship classification societies and are at variance with good practice. For some time past a committee acting under Congressional authority and with the co-operation of the Bureau of Navigation and Steamboat Inspection Service of the Department of Commerce has been working on a revision of the maritime laws. Considerable progress has been made and it is believed that the result will correct most if not all of the existing evils. But the matter should not be permitted to lag. American shipowners face too many obstacles to be handicapped at the start by antiquated Government laws and regulations. That the need for prompt action in this matter is acutely felt is shown by the fact that the National Merchant Marine Association has only recently adopted resolutions urging that the recommendations for the revision of the maritime laws be presented to the Congress without delay.

Shipbuilding Prospects

IN spite of the continued depression in the world's shipping there are pending in American shipyards orders for at least thirty-seven new vessels as well as a considerable volume of repair and reconditioning work. While this does not in any way indicate the approach of another shipbuilding boom, it does at least promise some relief for the shipbuilders. Most of the vessels for which bids have been asked are for coastwise or inland waterway service. They include combined passenger and cargo steamships for the Clyde, Southern Pacific, Old Dominion, Oceanic and New York and Porto Rico Lines, a fleet of twenty Diesel electric motorships for lake, canal and coastwise service, cargo ships for special interests and a number of special types of vessels for the inland waterways, including eight ferryboats for the city of New York.

Many of these contracts would probably have been placed weeks ago, if prices had not shown a tendency to stiffen. After a prolonged slack period, however, shipbuilders cannot be expected to take work at ruinous figures and there seems to be no indication of any marked reduction in the cost of shipbuilding materials. As a matter of fact, those who months ago put off the placing of orders for new tonnage in the expectation of securing more favorable prices later on missed a golden opportunity for the day of rock bottom prices seems to have passed and the price of steel apparently is destined to remain far above its level of eighteen months ago.

Meanwhile, certain of the steamship companies need new vessels and it is a question whether any possible saving in initial cost which might be made by waiting for more favorable prices would begin to compensate for the loss of business which might be gained by immediately adding new

tonnage to their fleets. On the other hand, the shipyards are badly in need of new contracts to maintain their skilled forces and it will not be long, if orders are further delayed, before the yards will be far less capable of turning out the work as efficiently and economically as they are today.

Shipyards Committee Appointed

ONE factor which may have a decided influence on the future of American shipbuilding is the work of the shipyards committee recently appointed for the investigation of general conditions affecting shipyards and ship repair plants throughout the country with a view to formulating recommendations for presentation at the forthcoming American Marine Congress in New York city, November 5 to 10. This committee, headed by J. Harry Mull, president of the William Cramp and Sons Ship and Engine Building Company, and including J. G. Pew, president of the Sun Shipbuilding and Dry Dock Company; H. G. Smith, vice-president of the Bethlehem Shipbuilding Corporation; E. P. Morse, president of the Morse Dry Dock and Repair Company, and J. J. Tynan, general manager of the Union Plant of the Bethlehem Shipbuilding Corporation, has already established headquarters in the office of the Atlantic Coast Shipbuilders' Association in Philadelphia and is seeking the co-operation of over two hundred establishments engaged in all branches of shipbuilding and marine repair work. This will give the shipbuilders a chance for co-ordinated action which is bound to reflect favorably on the future welfare of the industry.

Diesel Engines at the Marine Show

THE number of manufacturers and licensees of Diesel engines that are exhibiting at the forthcoming Marine Exposition at the Grand Central Palace, New York, during the week of November 5 to 10 is a significant indication of the belief of a great many shipping experts that this form of propulsion is bound to be the next important development in the establishment of our merchant marine upon an economic basis.

As stated by Professor Chapman in his comparison of steamships and motorships which appeared in the January, 1923, issue of this magazine, if capital is to be interested in shipping ventures it must be shown where it can make a reasonable profit on its investment. Professor Chapman gives this profit at 10 percent which, with the fixed charges of 15 percent for interest, insurance and depreciation, makes a total of 25 percent for the capital charge. Now with the Shipping Board apparently willing to practically give away good vessels providing they are converted to motorships, and with the total estimated cost of these converted vessels at \$50 or less per deadweight ton or about \$20 per ton less than they can be produced in England, it is evident that 25 percent on the difference in capital required to secure a good motorship here as compared with abroad is quite a subsidy in itself.

One thing is certain, and that is that those who have Diesels to sell believe in their future as the space devoted to the internal combustion engine at the Marine Exposition will exceed that given to all other forms of propulsion combined.

What Is the Remedy for the Shipping Situation?

By "Old Scotch"

We are rapidly approaching a showdown in shipping matters in this country. For the past two or three years, since the collapse of the great shipbuilding and shipping boom we have drifted along without a definite policy and without clear-cut leadership. The world trade has declined and freight rates have reached such a low level that the ships now conducting the ocean trade of the world seem only to vie with one another for bare existence without thought of profits to those who have their capital invested in them. We all know that the rehabilitation of normal conditions on the seas is a long time off, and depends upon the stabilization of the former European combatants in the Great War. Our own United States is the only one of the great nations of the earth which has even a semblance of prosperity. While we naturally are deeply interested in all that pertains to general world prosperity, we must consider our own interests of paramount importance; to retain these present fair conditions and to improve them where possible must necessarily receive our first attention.

IT has been conclusively demonstrated to the minds of all thinking Americans that much of the credit for our present comparatively better conditions is due to the fact that we have had sufficient American vessels to regulate freight rates on our exports and to establish and extend our foreign business in new territories. This has, to date, been accomplished principally by the medium of the Government-owned ships in foreign trade, operated by the Shipping Board through the existing system. This system has, owing to the general depression, been operated at a considerable direct loss, chargeable to operation alone. But in the broad view, this extension of the nation's business has resulted in a decided gain to our industries taken as a whole.

THE GOVERNMENT MUST HELP

Two outstanding conclusions may be deduced from our present shipping activities in foreign trade.

1. It is clearly proven from our experience with the operation of Government tonnage that we must have our own ships to conduct at least half of our own foreign trade.

2. To keep sufficient American ships in the foreign trade, to maintain even our present business conditions, and to better them when world trade improves, as they must at some time, the United States Government itself must help either directly or indirectly and perhaps both.

Regardless of the controversy between the Shipping Board and the steamship owners, which is now bringing the subject of Government ownership and operation or private ownership and operation to a crisis, the great object to be obtained is the guarantee to our farmers and merchants that a sufficient amount of American tonnage will be maintained.

LOSSES TO BE REDUCED

Whatever may be the outcome of the dispute between the Shipping Board and the shipowners, it seems to be a settled fact that the present system of operation of Government tonnage is to be replaced by some other method in order to reduce, if possible, the direct financial loss to the National Treasury. This undoubtedly can be accomplished, but just now is the all-absorbing question of the hour.

Direct subsidy in the manner prescribed by the bill which failed of action in the last Congress would undoubtedly have solved the problem, but that now seems to be out of the question for reasons which need not here be discussed.

While it is true that our foreign trade, that is such portion as is being carried under the American flag, is borne in ships directed by the Shipping Board, the future of the American merchant marine in foreign trade is much broader than the mere question of Government or private ownership. The Shipping Board and the Shipowners' Association, while

parties most interested in the present situation, are not alone sufficient to decide on the great shipping question now before the country. The farmers, manufacturers and merchants have the greatest interest in the subject, as the correct solution will largely enter into the question of their success in the future.

MARINE CONGRESS TO POINT THE WAY

Fortunately for all concerned is the fact that the all-American Marine Congress has been called, to meet in New York the first week in November (5th to 10th, inclusive). There will assemble representatives from all branches of industry, directly or indirectly interested in shipping. The proposal for this Congress has been seized upon with the greatest enthusiasm, and representative men will be present from all sections of the country. The farmers will be represented by delegates from the American Farm Bureau, the manufacturers by a number of prominent organizations including the American Manufacturers' Export Association and the United States Chamber of Commerce. All shipbuilding and shipping organizations have appointed delegates, as have various labor associations. Numerous transportation companies, whose interests are closely allied with foreign shipping will through able representatives take part in the discussions. Municipal authorities interested in commerce will be represented to discuss port facilities. The American Legion, the greatest of all our patriotic societies, will have delegates and members present. The marine branches of the Federal Government will each have a representative present to join in the work of the Congress.

With such a galaxy of talent present and sincerely interested in the subject, it is plain to be seen that all phases of the shipping problem can be intelligently discussed by men who can speak.

ENFORCEMENT OF EXISTING LEGISLATION MAY BE URGED

It is difficult even to predict what the recommendations of this gathering will be, but it is safe to assume that intensive consideration will be given to the legislation already on the statute books, which if enforced or invoked will be of great assistance to the maintenance of American ships in the foreign trade. Although former Presidents Wilson and Harding, for reasons which they deemed sufficient, failed to put the policy of discriminating duties in force, it may yet be possible, by certain modifications which may be recommended by the Congress, to convince President Coolidge of the desirability of resorting to that method of encouraging our shipping. Some experts claim that the principle of discriminating trade can be applied advantageously in the indirect trade, such as the Central and South American routes,

without resorting to the abrogation of existing treaties with the great shipowning nations.

The sections of the Jones Act providing for preferential railroad rates on goods carried in American bottoms have not yet been enforced, and give promise of considerable help if properly worked out and applied.

EXTENSION OF COASTWISE LAWS TO THE PHILIPPINES

The inevitable enforcement of the provision relating to placing the Philippines under the coastwise law will be a great boon to American shipping. There now seems but little reason why President Coolidge should delay in making that portion of the Jones Act operative. A good strong resolution from the Marine Congress might have a very beneficial effect towards accomplishing that much desired action.

The increase in freight rates feared by our Philippine brethren (the fear largely inculcated by our shipping rivals in Europe) has been proved to be largely a bugaboo, by comparison with existing freight rates between New York and San Francisco, a distance about the same as from the latter port to Manila. It is estimated that there are 1,272,780 tons of shipping engaged in the Philippine trade. The United States would undoubtedly secure three-fourths of this



Automobile Ferryboat Motor Princess Built for Canadian Pacific Railway

trade for our own ships, if the coastwise laws are made applicable, as now authorized by law.

As before stated, the Government must help to retain the American flag in foreign trade, and the Marine Congress will inevitably devote much of its time to discussing and recommending ways by which this Governmental help can be efficiently applied without too much drain on the Treasury.

UTILIZATION OF NAVAL FORCES ON MERCHANT VESSELS

It has been suggested that the wage differential, now the most serious handicap on American ships in world wide competition, may be overcome by utilizing enlisted men from the authorized personnel of the Navy on ships engaged in the foreign trade. Despite the opinion of strictly militarists, it is very apparent that the impoverished nations of the world will not be able to engage in any great conflicts on the sea for some years yet to come. While we all believe in preparedness, there is no particular use in over preparedness, and we must use good sane judgment in appraising conditions which can arise. The utilization of naval forces on merchant vessels would in no way detract from their readiness to meet any emergencies which might arise, and at the same time they may be extremely useful in helping to solve our merchant marine problem.

These and other phases of the problem will most likely receive attention at the forthcoming marine gathering, and it is but fair to presume that the recommendations made will be based on the good sound judgment of all interested parties.

SHIPPING BOARD SHOULD POSTPONE ACTION

In view of the near approach of this all-American Marine Congress, of the great diversity of the interests represented, and of the intelligent discussion which will ensue, does it not appear that it would be fitting for the Shipping Board to postpone any definite policy regarding the method of using its ships, until they can have the benefit of the recommendations made by this nation-wide council?

New Motor Ferryboat Has Capacity for Fifty Cars

THE new *Motor Princess*, built by the Canadian Pacific Railway, is said to be the first specially built automobile ferryboat in the world, and a new floating link in the chain of friendship binding the United States and Canada together. Motorists board her, 250 strong and 50



600 Horsepower McIntosh & Seymour Diesel Engines of the Motor Princess

cars at a time, at Bellingham, Wash., cross the Gulf of Georgia to Sidney, Vancouver Island, run their cars off the boat and tour over automobile roads to Victoria and Nanaimo, or farther north.

The *Motor Princess* is a staunch craft 170 feet long and 42 feet wide, with decks 11 feet high. She is driven at a speed of 14 knots by two 600 horsepower McIntosh & Sey-



Main Parking Deck Looking Forward to Ramp Leading to Upper Parking Deck

mour Diesel engines, and there are ample observation and smoking rooms, as well as a ball room and tea room, for the comfort of passengers during the three hours' trip between the States and Canada. Last year 18,000 automobiles were carried on the *Princess* steamers from Seattle to Victoria and Vancouver, and now that the *Motor Princess* is at their service it is expected that even more will visit Vancouver Island and the British Columbia mainland.

Shipping Board Plan Held Illegal

Attorney General Advises President Shipping Board Lacks Authority to Carry Out Proposed Plan

By Harold F. Lane

WASHINGTON, D. C.

ATTORNEY General Daugherty on September 19 threw a large monkey-wrench into the plans of the Shipping Board for operation of the Government fleet through 12 to 18 subsidiary corporations of the Emergency Fleet Corporation, whose stock was to be owned by the Shipping Board, by giving President Coolidge an opinion, at his request, that the so-called Farley-Lasker plan, suggested by the policy committee of the board as a substitute for the present plan of operating through managing agents, is illegal. The result is expected to be that the whole question of Shipping Board policy will again be thrown before Congress at the coming session.

RESULT NOT UNEXPECTED

Such an opinion from the attorney general was not exactly unexpected, as it is in line with the opinions of three of the seven members of the Shipping Board who had voted against the adoption of the subsidiary plan, as well as of many others outside the board, although counsel for the board had declared the plan legal, and President Coolidge had previously let it be known that, even if the plan were held legal, he proposed to have a further study made of the advisability and wisdom of the policy, by the special committee which he had suggested.

The President regards it as fundamental, it was said at the White House, that any plan of operation must be such as will assure adequate shipping facilities for the commerce of the country and at the same time provide a merchant marine auxiliary to the Navy for the national defense.

It was also stated officially after the President had received the opinion of the attorney general that he had no new policy to suggest and that it is not the business of the President under the law to try to formulate policies for the Shipping Board, although he would be glad to and expected to confer shortly with the members of the board as to some plan for trying to get the ships into private hands as soon as possible. It was added that the plan had appealed to him as probably the best step toward liquidation and private operation that could be taken at this time but that since it has been decided impossible to make it effective under the present statute he did not know what would be done or whether the board would desire legislation.

ALTERNATIVES AVAILABLE

The alternatives left to the board now apparently are to try to work out further economies under the present plan; to adopt for the entire fleet a plan similar to that under which the United States Lines operate, with a salaried manager employed directly by the Government, or to ask for some modification of the law.

Attorney General Daugherty advised the President that the Government does not possess the power under the Merchant Marine Act to carry out the proposed plan of the Shipping Board to dispose of Government-owned ships through the incorporation under state laws of corporations authorized to own and operate such craft. He was of the opinion, he added, that the statute authorizes a sale of the ships and not an exchange of title thereto in consideration of stock in a corporation, which the proposed plan of the Shipping Board contemplated when the matter was placed before President Coolidge for consideration.

It evidently was the intention of Congress, Mr. Daugherty said in his opinion, to authorize a sale for cash or on credits not to exceed 15 years from the making of the contract of sale, and that an exchange whereby the Government receives shares of stock in return for its ships is not a sale within the provision of the act and does not meet the condition limiting deferred payment. Moreover, if the transfer of vessels to state corporations in return for the issuance of capital stock is to be regarded as a passing of title authorized by the sale provisions of the act, the attorney general added, "it is obvious that Section 14 of the act must be ignored, for its provisions, as we have seen, contemplate the payment of money and not shares of stock into the Treasury of the United States as miscellaneous receipts."

If any weight is to be given to the long settled legal principle that a corporation is a distinct juristic person, holding its property and exercising its corporate function through the appointed agents, Mr. Daugherty said, "it must be admitted that under the present proposal the Government will in a real and substantial sense part with title to its vessels."

GOVERNMENT NOT AUTHORIZED TO TRANSFER SHIPS

Serious questions likely would arise as a consequence of the assumption by the Government of the ownership of stock in a private corporation controlled by state law, the attorney general pointed out, as it possibly would be contended that under statutes imposing assessments to meet the debts of the corporation the Government would be liable as any other stockholder. The vessels transferred to the corporation, he added, might even become legally subject to state taxation, and such immunity from suit as the Government now enjoys with respect to the operation of its fleet would very likely disappear. Undoubtedly, also, the attorney general further explained, the directors and officials of the proposed corporations would not be officers of the United States, and thus the United States in the administration and operation of its shipping industry would lose (except under statutes like that under consideration in United States vs. Bowman, 206 U. S. 94) the benefits of the sanctions provided by law to secure the good conduct and public accountability of its agents.

These considerations, Mr. Daugherty said, impelled him to the opinion that it was not the intention of Congress to authorize the executive branch of the Government to organize corporations to take title to the Government's ships, and in the place of responsible Government control by the Shipping Board substitute a management by directors of private corporations amenable alone to the laws of another sovereignty. There have been instances of the formation of corporations to aid in the discharge of administrative function the attorney general explained, adding that, however, in each case, so far as he was aware, there had been unmistakable legislative authority. There is no language of like import in the statute now under consideration, Mr. Daugherty declared, and he concluded that, "the authority to transfer the ships to private corporations can not fairly be rested on the provisions in the act relating to sales."

Is it possible to construe the provisions relating to the maintenance and operation of the fleet as permitting, as a method of operation, the proposed transfer? Mr. Daugherty asks, and proceeds to answer the question by quoting sections

7 and 12, of the act, which relate to the establishment and operation of steamship lines, reconditioning, etc., asserting that there is no further provision, than is found in the two sections quoted, for the delegation of the authority confided by the statute in the officials of the Shipping Board.

"It is a well settled rule," Mr. Daugherty said, "that a public officer or public body can not delegate powers which require the exercise of judgment or discretion. . . . The operation and maintenance of the fleet until sold was entrusted by Congress to public officials who are at all times subject to congressional control. It cannot be admitted that this important trust can be put in the hands of the directors of a private corporation who bear no official relation to the Government; who are merely the trustees of the corporation and removable as such only through the processes of corporate management prescribed by the various and varying systems of state law.

"Moreover," continued Mr. Daugherty, "if the proposed plan is to be regarded not as a sale, but merely as a method of operation, it does not conform to the program set forth in section 12 (of the act). This section contemplates that operation shall continue only until the vessels are sold. *And yet under the plan it is made impossible to sell the ships hereafter for the reason that the Government will have placed the legal title to them in the proposed corporation and will have nothing to sell except the stock which it has received in exchange.*"

Mr. Daugherty called attention to the fact that when the bill for a merchant marine act was introduced in the House it contained a provision which stated that the power and authority vested in the board might be exercised directly by the Shipping Board, or by it through the United States Emergency Fleet Corporation or other agencies created pursuant to authority of law. The underscored words were stricken out in the Senate, and the House agreed to the amendment. This circumstance, Mr. Daugherty said, was significant, and it "negatives the idea that Congress intended that the power and authority vested in the board should be exercised by any one outside the board itself or the Emergency Fleet Corporation."

BOARD CANNOT MAKE RULES TO COVER PLAN

In connection with the suggestion that the power of the Shipping Board under the law to make rules and regulations might be broad enough to authorize the board to put into execution the plan proposed, Mr. Daugherty states that Section 19 of the act directs the board to aid in the accomplishment of the purposes of the act to make all necessary rules and regulations to carry out its provisions . . . "rules and regulations which are not inconsistent with the act or which are not unreasonable or inappropriate."

But rules and regulations not authorized by the statute, the attorney general held, would be invalid, and the authority to promulgate rules and regulations "can, therefore, add nothing substantial to the powers conferred."

Finally, Mr. Daugherty says, the question is presented whether the language of section 1 confers the power proposed to be exercised.

"That section, as we have seen," the attorney general advises, "announces a national policy. After declaring that for the national defense and for the growth of commerce it is necessary that the United States should have a merchant marine ultimately to be owned and operated privately by its citizens, the section provides . . . 'it is hereby declared to be the policy of the United States to do whatever may be necessary to develop and encourage the maintenance of such a merchant marine, and, in so far as may not be inconsistent with the express provisions of this act, the United States Shipping Board shall, in the disposition of vessels and shipping property as hereinafter provided, in the making of rules and regulations, and in the administration of the shipping

laws keep always in view this purpose and object as the primary end to be attained.'

"But this adds nothing to the power conferred. The language is that in the disposition of the vessels and shipping property 'as hereinafter provided' this end shall always be kept in view. The authority to sell and until sold to operate the Government vessels was conferred in subsequent sections; and, within the scope of the powers given, the board is directed to keep in view the policy and purpose thus announced. Although the title or preamble of an act may be referred to when ascertaining the meaning of a statute which is susceptible of different constructions, they cannot control or restrain express provisions. . . . Nor can they enlarge or confer powers. . . . I accordingly have the honor to advise you that in my opinion the power to carry out the proposed plan does not exist."

President Coolidge has devoted very close study during recent weeks to the situation of the Shipping Board and its proposed plan and several times had called upon the board for further details and estimates as to how much it would cost and what savings could be effected as compared with the present plan. He had also called the entire membership of the board into conference with him at the White House on the evening of August 30, at which he is said to have been a "good listener." It was after this conference that the attorney general was asked for a formal opinion, although it is understood that the board had previously received informal assurances that its plan would not be in violation of the existing law.

CONFERENCE WITH SHIP OWNERS AND OPERATORS

There was practically nothing in the way of definite results from the all-day conference held between the board and committees representing the steamship operators and owners at Washington on August 28, at which the latter were given an opportunity to submit alternative plans. A new plan as a substitute for the present managing operator contract was proposed by C. H. Potter on behalf of the United States Ship Operators' Association, the purpose of which was to put on the operator or agent a greater measure of responsibility than at present, so that, if the present losses increase, the agent would bear a substantial share of such increase, whereas, if they diminish, he would receive some of the resulting benefit. It was proposed to set up an agreed standard figure for each trade route to represent the net result per voyage and that, if the agent should do no better than this standard, he would receive no compensation for operation but only a husbanding fee. If his operation should show a surplus above the standard figure, it would be divided on an agreed percentage basis between the board and the operator and a certain percentage of the amount received by the board was to go into a purchase and building fund which might be applied on the purchase of ships by the operator.

Gale H. Carter, vice-president of the American Steamship Operators' Association, also presented a statement of arguments against any plan of Government operation with a suggestion that the board and the shipping men endeavor by co-operation to work out a "plan by which the Government ships can be most efficiently and economically operated by private parties and ultimately transferred to private ownership," and "the board gradually retired from the shipping business."

Chairman Farley, however, gave no indications of having been at all impressed with the alternative suggestions presented by the shipping men and said that, if anything were to be accomplished, the board must have more concrete and specific proposals and without delay. The conference was adjourned with the idea that the shipping men might get together and formulate a more definite plan for the consideration of the board later, if they could do so within very short time.

Secretary Hoover to Preside as Chairman of the Marine Congress During American Marine Week

Greatest Convention Ever Held of Commercial, Manufacturing, Farming and Maritime Associations to Discuss Merchant Marine Problems During Week of November 5 to 10

THE eyes of the nation will be focussed on New York during the week of November 5 to 10, for in the space of six short days technical and practical shipping questions and the exhibits at the great annual Marine Exposition will be given the widest publicity. The fact that organizations in such cities as Omaha, Duluth, Cincinnati and many other interior points are going to the expense of sending delegates to this Congress shows that the country at last has awakened to the necessity of an American merchant marine.

The writer attended a farmers' conference in Cincinnati on the merchant marine in June and he was greatly surprised and pleased to see the enthusiasm displayed by the delegates on shipping matters. They have come to realize that their prosperity depends on economical and efficient transportation of their products and with that realization has come the determination to find a solution that will induce private capital to invest in shipping.

There are four major groups of our industries, namely: Agriculture, mining, manufacturing and transportation. The first three have been developed far beyond the actual needs of the country and now agriculture in particular is severely suffering because we have, in our laws and our regulations, handicapped our transportation facilities. In fact, our merchant marine is now threatened with the evil of direct Government operation which the former chairman of the Shipping Board, Albert D. Lasker, once characterized as "poison ivy in the garden of industry."

It is useless to harp on what might have been done if the subsidy bill had been passed. We are faced with the problem of making a new start but with the facts and findings arrived at by a non-partisan body—and our merchant marine question is just as non-partisan as our army or navy—representing all sections of the country, we will have something to build on that Congress will not dare to ignore.

This Congress, as we have said in our title, will be presided over by Secretary Hoover whose reputation for efficiency in organization and for getting results is international.

Announcement of the personnel of the Great Lakes District Committee; a special technical committee to represent the shipowners of the Great Lakes; a committee representing the agricultural interests of the Mid-West, and the Marine Insurance and Classification Committee, in connection with the Congress is the latest word from the headquarters of the American Marine Association, at whose invitation the Congress will be held. Inasmuch as the chief executives of four cities are listed as members of the Great Lakes Committee, much is expected of the group whose personnel is the more interesting when it is remembered that the mayors of six cities have already consented to serve on the Delaware District Committee.

The make-up of the Great Lakes District Committee, which will represent the regional interests of all of the Great Lakes States and which is now complete, is as follows:

Chairman, F. C. Bradbury, manager of the Marine Department of the Crane Company, Chicago, Ill.
Honorary Chairman, Hon. William E. Dever, Mayor of Chicago, Ill.
Hon. George E. Leach, Mayor of Minneapolis, Minn.
Hon. Fred Kohler, Mayor of Cleveland, Ohio.
Hon. Judge B. F. Brough, Mayor of Toledo, Ohio.

William M. Pattison, president, The W. M. Pattison Supply Company, Cleveland, Ohio.

R. E. Sawhill, editor, *Marine Review*, Cleveland, Ohio.

Harold Emmons, president, Detroit Board of Commerce, Detroit, Mich.

C. E. Boyd, assistant secretary, Detroit Board of Commerce, Detroit, Mich.

A. A. Schantz, president, Detroit & Cleveland Navigation Company, Detroit, Mich.

W. W. Nichols, vice president, Society of Industrial Engineers, Detroit, Mich.

Robert June, Diamond Power Specialty Company, Detroit, Mich.

A. M. Creed, Creed & Company, Detroit, Mich.

John Cowell, president, Board of Trade, Toledo, Ohio.

P. R. Merk, Board of Trade, Duluth, Minn.

Walter J. Fitzgerald, Lake Transportation & General Insurance, Milwaukee, Wis.

Harwood Frost, Terminal Engineer, Chicago, Ill.

F. E. Heath, Association of Commerce, Grand Rapids, Mich.

A special Technical Committee, which will represent the Great Lakes Ship Owners, is making rapid strides in the formulation of a policy which is expected to tie together the shipping men of the Great Lakes and the shipping men of the coast. This committee is as follows:

Chairman A. A. Schantz, president, Detroit & Cleveland Navigation Company, Detroit, Mich.

C. F. Bielman, secretary and general manager, White Star Lines.

Oliver S. Dustin, vice president, Ashley & Dustin.

P. G. Findlay, traffic manager, Dodge Bros. Auto Company.

Henry T. Ewald, president, Ewald Advertising Agency.

A powerful group under the leadership of George A. Carey, secretary of the Omaha Chamber of Commerce, will represent the agricultural interests of the Mid-West and is in itself a notable committee. It is made up as follows:

Chairman, George M. Carey, secretary of the Omaha Chamber of Commerce.

Carl H. Gray, president, Union Pacific Railroad, Omaha, Neb.

Henry W. Meile, vice president, Merchants National Bank of Omaha, Nebr.

H. D. Lute, secretary of Nebraska Farmers Bureau Association, Lincoln, Nebr.

Joseph F. Leopold, general secretary, Iowa State Chamber of Commerce, Des Moines, Iowa.

James F. Coupe, assistant secretary, Iowa Farm Bureau Association, Des Moines, Iowa.

Harry L. Keefe, president, Nebraska Farm Bureau Association, Walthill, Nebr.

Additional committee personnel is announced with the naming of the Marine Insurance and Classification Committee, which is made up as follows:

Chairman, S. D. McComb, manager, Marine Office of America, New York City.

Captain C. A. McAllister, vice president of the American Bureau of Shipping, New York.

Charles D. Mather, Philadelphia.

Frank Gair Macomber, Boston, Mass.

James A. Mathews, San Francisco, Cal.

The latest word received on committee-chairmanship acceptances is that R. S. MacElwee, commissioner of the Port of Charleston, S. C., has agreed to serve as head of the Southern States District Committee.

With regard to the Marine Show, the list of exhibitors is growing steadily, one of the latest additions being the port of Charleston, S. C.

The following is a list of exhibitors who have already

reserved space for the 1923 exposition, together with their booth numbers:

	Booth No.
Ajax Rope Company, Inc., 149 Broadway, New York.	44
Akimoff Propeller Company, Harrison Building, Philadelphia, Pa.	67-B
American Car & Foundry Company, 165 Broadway, New York	85 (part)
American Krupp System Diesel Engine Company, 165 Broadway, New York.....	80
American Society of Marine Designers, 29 West 39th Street, New York.....	294 and 295
American Steel Foundries, Chicago, Ill.....	52
Asbestolith Manufacturing Company, 1 Madison avenue, New York	97
Ashton Valve Company, 161-179 First Street, Cambridge 41, Boston, Mass.....	(part of) 18 and 19
Babcock & Wilcox Company, 85 Liberty Street, New York	76-77
Beaver Tile, Inc., 442 West 42nd Street, New York...	11
Bethlehem Shipbuilding Corporation, Ltd., Bethlehem, Pa.	68
Briggs Engineering Works, 227 24th Street, Brooklyn, N. Y.	104
Brown Instrument Company, 50 Church Street, New York	65-B
Burmeister & Wain, Ltd., 27 Whitehall Street, New York	86
The Coen Company, 50 Church Street, New York....	79
Wm. Cramp & Sons Ship & Engine Bldg. Company, Philadelphia, Pa.	70-71
Crane Company, 836 South Michigan Avenue, Chicago, Ill.	66
Crane Packing Company, 59 Park Place, New York...	227
Diamond Power Specialty Corporation, Detroit, Mich..	74
O. M. Edwards Company, Inc., Syracuse, N. Y.....	15
Electric Storage Battery Company, 26 West Broadway, New York	31
Electro Sun Company, Inc., 161 Washington Street, New York	253
L. W. Ferdinand Company, 152 Kneeland Street, Boston, Mass.	228
Fire Detecting Wire Corporation, 2 West 45th Street, New York	335-336
Foster Marine Boiler Corporation, 111 Broadway, New York	101
General Carbonic Company, 542 Fifth Avenue, New York	49
General Electric Company, Schenectady, N. Y.....	3-4-5-6
B. F. Goodrich Rubber Company, Akron, O.	84 (half)
Griscom-Russell Company, 90 West Street, New York.	60
Hill Rotors, Inc., 42 Broadway, New York.....	252
Hooven-Owens-Rentschler Company, Hamilton, Ohio..	17
Journal of Commerce and Commercial Bulletin, 32 Broadway, New York	50
Walter Kidde & Company, 140 Cedar Street, New York	49
Knudsen Motor Corporation, 30 Church Street, New York	81
London Steam Turbine Company, 149 Broadway, New York	29
Lunkenheimer Company, Cincinnati, O.....	95
McIntosh & Seymour Corporation, Auburn, N. Y.....	59
Mack Engineering & Supply Company, Inc., 136 Liberty Street, New York.....	348
Marine Decking & Supply Company, 116 North Delaware Avenue, Philadelphia, Pa.....	110
MARINE ENGINEERING AND SHIPPING AGE, 30 Church Street, New York.....	94-106
The Marine News, 26 Water Street, New York.....	83
The Marine Review, Cleveland, O.....	30
Morse Dry Dock & Repair Company, foot 56th Street, Brooklyn, N. Y.	72
National Malleable Castings Company, Cleveland, O...	57
National Meter Company, 229 Broadway, New York...	14
Natural Carbonic Gas Company, Newark, N. J.....	267
Newport News Shipbuilding & Dry Dock Company, Newport News, Va.	32
Northern Fire Apparatus Company, Minneapolis, Minn.	54
Pantasote Company, 11 Broadway, New York.....	28
Peabody Engineering Corporation, 110 East 42nd Street, New York	13

	Booth No.
Pneumercator Company, 40 Flatbush Avenue, Brooklyn, N. Y.	36
Port of Charleston, Charleston, S. C.	255
Power Specialty Company, 11 Broadway, New York...	101
Radio Corporation of America, New York	48
The Roto Company, Hartford, Conn.....	266
Row & Davis Engineers, Inc., 90 West Street, New York	63
R. S. V. Valve Corporation, New York	51
Rubber-All-Products Company, 821 Broadway, New York	69
Scovill Manufacturing Company, Waterbury, Conn....	58
Shipley Construction and Supply Company, 42nd Street and 2nd Avenue, Brooklyn, N. Y.....	33
Sperry Gyroscope Company, Manhattan Bridge Plaza, Brooklyn, N. Y.....	20-21-22-23
The Sterling-Cooper Corporation, 220 West 42nd Street, New York	67-A
B. F. Sturtevant Company, Hyde Park, Boston, Mass.	107
Submarine Signal Company, Boston 9, Mass.....	256
Sun Shipbuilding Company, Chester, Pa.....	78
The Superheater Company, 17 East 42nd Street, New York	73
The Texas Company, 17 Battery Place, New York....	35
W. & J. Tiebout Company, 118 Chambers Street, New York	27
P. S. Thorsen & Company, Inc., 82 Coffee Street, Brooklyn, N. Y.....	98
Valentine & Company, 456 Fourth Avenue, New York.	43
Westinghouse Electric & Manufacturing Company, 165 Broadway, New York.....	82-83
C. H. Wheeler Manufacturing Company, Lehigh and Sedgley Avenues, Philadelphia, Pa.....	7
Worthington Pump & Machinery Corporation, 115 Broadway, New York.....	96

Naval Architects and Marine Engineers to Hold Annual Meeting in New York on November 8 and 9

THE thirty-first general meeting of The Society of Naval Architects and Marine Engineers will be held in the Engineering Societies Building, 29 West 39th Street, New York City, Thursday and Friday, November 8 and 9. Professional sessions will begin at 10 A. M. each day.

The following papers will be read and discussed at the professional sessions:

THURSDAY, NOVEMBER 8

- "Additional Notes on American Shipyard Apprenticeships, Evening Schools and Scholarships." By Charles F. Bailey, member of council.
- "Comments on Aviation, Naval and Commercial." By Captain Emory S. Land, CC. U. S. N., member.
- "Some Factors Affecting the Economy of Operation of the Lake Freighters." By Professor Anders Linblad, member.
- "Wetted Surface." By Henry H. Schulze, member.
- "Propeller Design Based Upon Model Propeller Experiments." By Rear Admiral David W. Taylor, CC. U. S. N., (Retired), honorary vice-president.

FRIDAY, NOVEMBER 9

- "The Probable Effect Upon Ports of the Probable Growth of Ships." By Commander John H. Walsh, CC. U. S. N., (Retired), member.
- "The Economics of Trans-Atlantic Liners of Various Lengths." By Carl E. Peterson, member.
- "The Manufacture of Heavy Steel Castings for Ships with Special Reference to Stern Frames, Rudders, Shaft Brackets and Stems." By Hugo P. Frear, member of council.
- "Fuel Conservation and Engineering Performance Standards by Shipping Board Vessels." By Joseph E. Sheedy, member.
- "Some Considerations on the Conversion of Steamships to Motorships." By Robert Haig, member of council.

The annual banquet will be held in the Grand Ball Room of the Waldorf-Astoria Hotel, New York City, on Friday evening, November 9, at 7:30 P. M. Immediately preceding the banquet there will be a reception beginning at 7:00 P. M.

What Shall Be Done with the Ex-German Transatlantic Passenger Liners *Agamemnon* and *Mount Vernon*?

Conversion to 18-Knot Oil Burners Would Cost Only \$3,000,000 Each and Would Provide Excellent Running Mates of the *George Washington* for Next Year's Passenger Business

[Contributed]

THE twin screw steamships *Agamemnon* and *Mount Vernon*, formerly known as the *Kaiser Wilhelm II* and *Kronprinzessin Cecilie* respectively, were prior to the war familiar to the transatlantic traveling public as the crack ships of the North German Lloyd Line. Both are now lying in idleness, one at Boston, Mass., and the other at Brooklyn, N. Y., and because of the vicissitudes of the United States Shipping Board and Emergency Fleet Corporation are apparently destined to remain in idleness. It is apropos to present a brief review of the histories of these vessels leading up to the events which now find them, splendid as well as profitable in their day of passenger service, inactive rather than as a valuable part of the United States Lines' fleet.

The *Agamemnon* was built by the Vulcan Works, Stettin, Germany, in 1902, and was first placed in service in the early part of 1903. We are told that after but one year on the Atlantic run the financial results and the fine performances of the vessel in other respects were so gratifying that the North German Lloyd immediately placed an order with the same shipbuilding firm for a similar vessel. The keel for the second vessel, the *Mount Vernon*, was laid in 1905. The vessel was launched in 1906 and placed in service alongside of the *Agamemnon* in the latter half of 1907. Both vessels continued in this service, proving veritable gold mines for their owners, until the beginning of the war brought their careers as a part of Germany's merchant marine to a close.

VESSELS SHOULD BE CREDITED WITH A HANDSOME BALANCE FOR TRANSPORT SERVICE

The entry of the United States into the war brought with it the seizure of both vessels which were subsequently overhauled and fitted out as troop transports. The service these vessels rendered in this respect is too well known for further comment but it may be mentioned that if the vessels were credited with the number of troops carried at the standard troop transportation rate then prevailing we may be assured that the vessels would show a very considerable balance in their favor quite apart from the other services.

The *Agamemnon* was put out of commission as a transport and turned over to the Shipping Board on November 22, 1919, and on the 24th plans and specifications for her reconditioning commenced, the services of Messrs. Kindlund and Drake, naval architects, being engaged for the purpose of making a survey and preparing plans showing the vessel in its present condition. On March 24, 1920, the vessel was sent to the New York Navy Yard where the engines, boilers and auxiliary machinery were thoroughly overhauled, new lifeboats and mechanical davits fitted and other repairs

made to the extent of an approximate expenditure of \$2,056,000. The *Mount Vernon* was put out of commission as a transport, turned over to the Shipping Board and placed in the Boston Navy Yard to have similar work carried out to the extent of an expenditure of approximately \$625,000.

POTENTIAL VALUE OF THE VESSELS RECOGNIZED

The International Mercantile Marine Company, knowing these vessels' age and condition, in their bid for the purchase of the ex-German passenger vessels dated January 17, 1920, included one or both in the three proposals submitted showing that a reputable and responsible concern was keen to realize the potential value of a fleet including the *Agamemnon* and *Mount Vernon*.

On May 28, 1920, a contract was entered into between the Shipping Board and the United States Mail Steamship Company whereby that company would acquire a number of the ex-German vessels, arrange for their reconditioning and place them in the transatlantic service; included among these were the *Agamemnon* and *Mount Vernon*. Coincident with the work which was being carried out by the Navy Yards a complete study was made by the United States Mail Steamship Company's technical staff. Plans and specifications for reconditioning the vessels were prepared for restoring in general their original arrangements having in view the appointments desired by the American ocean traveler rather than that of the heavy Continental character which previously obtained. An alternative arrangement was prepared for converting the vessel to burn oil instead of coal for fuel. By August, 1921, this work had progressed almost to the point of obtaining firm bids from the various shipyards when the company, being out of harmony with the board and unable to finance its undertaking, was forced into bankruptcy and the reconditioning of the vessels was suspended.

UNITED STATES LINES FAVORED RECONDITIONING THE VESSELS

The United States Lines succeeded the United States Mail Steamship Company in the operation of the Shipping Board's transatlantic fleet of passenger vessels. It was not long before it became apparent that it was desirable to augment this fleet with vessels having more speed, greater tonnage and finer appointments than the majority of its vessels then offered; and again the *Agamemnon* and *Mount Vernon*, potential high grade liners, were looked to as being the only suitable vessels which could be placed in service within a reasonable time.

It will be recalled that careful studies of probable revenues and expenditures were made and in one instance published.

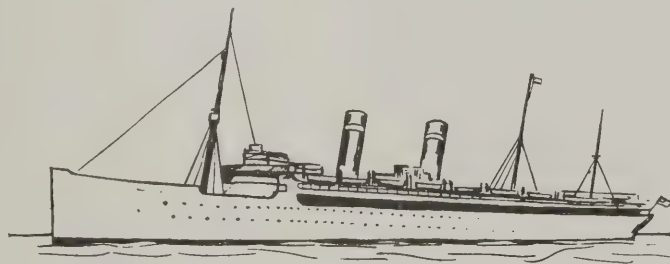


Fig. 1.—Sketch Showing How the *Agamemnon* and *Mount Vernon* Would Look if Converted to 18-Knot Oil Burners

(See MARINE ENGINEERING AND SHIPPING AGE, January, 1922). All of these were favorable to the reconditioning of the vessels. Later, at the time the Shipping Board was considering the authorization for proceeding with the actual reconditioning of the *Leviathan*, Mr. T. H. Rossbottom, general manager of the United States Lines, was extensively quoted in the press as saying that, if he were given the choice between the *Leviathan* and the *Agamemnon* and *Mount Vernon*, he would choose the latter two, thus indicating the desirability from an operator's viewpoint of having these two vessels in service. It might also be mentioned here that Mr. Rossbottom in his testimony on April 11, 1922, at the joint hearings before the committee on commerce of the United States Senate and the committee on the merchant marine and fisheries of the House of Representatives, said that, if he had the *Mount Vernon* and *Agamemnon* in the North Atlantic service, those vessels could make money in either Government or private operation.

Upon Shipping Board Commissioner Frederick I. Thompson's return from Europe on September 15, 1922, the question of reconditioning these vessels was again brought forward by his advocacy of placing them in service in view of the demand for accommodations on the United States Lines' vessels. Nothing further was done until November 17, when an inspection was made of the *Agamemnon* then lying at Hoboken, N. J. This inspection party was headed by Commissioner M. Lissner and was composed of Messrs. W. J. Love and Joseph Sheedy, vice-presidents; Mr. John Bailey, assistant manager of repairs; Col. R. M. Watkins, operating manager, all of the Emergency Fleet Corporation; Mr. W. F. Gibbs, of Gibbs Brothers, Inc., Mr. Carl E. Petersen and Mr. Wm. L. Bunker, naval architect and superintendent engineer, respectively, of the United States Lines. The excellent condition of the vessel together with its suitability after reconditioning for the passenger service so favorably impressed the Shipping Board officials they decided to direct that a survey be made of both the *Agamemnon* and the *Mount Vernon*.

BOARD OF SURVEY APPOINTED

On December 13, 1922, it was announced that the Board of Survey which was to examine the vessels with a view to making recommendations for their future use had been formed. The members of this board were: Mr. W. F. Gibbs, of Gibbs Brothers, Inc., chairman; Mr. Joseph W. Powell, former president of the Emergency Fleet Corporation; Mr. C. F. Bailey, chief engineer of the Newport News Shipbuilding and Dry Dock Company; Captain C. A. McAllister, vice-president of the American Bureau of Shipping, and Mr. Harry Brown, formerly of the Bethlehem Shipbuilding Corporation.

It will be recalled Mr. Powell had, after having retired from the Emergency Fleet Corporation some time previous to this, surveyed these vessels and submitted an estimate of reconditioning costs to Chairman Lasker. Mr. Powell's exact figures were not given out but it is understood that it was estimated that between \$5,000,000 and \$6,000,000 for both would be required to put them in service as three-class ships but as coal burners. Conversion to oil would require about \$450,000 additional outlay per ship.

The Board of Survey proceeded to make a thorough inspection and detailed study of these vessels and their findings and recommendations confirmed all that had previously been stated relative to the condition of the vessels and their suitability for active passenger service. This board estimated that the cost of changing the fueling system from coal to oil and refitting the liners as modern three-class steamers would be from \$4,000,000 to \$4,500,000 each. The Shipping Board at a meeting on March 14, 1923, instructed Messrs. Gibbs Brothers, Inc., to proceed to draw up plans and specifications so that these could be sent to prospective bidders the first week in June.

An idea of the extensive work called for by these plans and specifications can best be realized by the fact that in the latter part of May the Shipping Board was advised that the cost of carrying out the work specified would certainly exceed \$8,000,000 for each vessel whereupon the Shipping Board abandoned the project as proposed and passed a resolution to ask the next Congress to appropriate \$24,000,000 to build two new ships.

SHALL THE VESSELS BE SCRAPPED?

To anyone who has had the opportunity to inspect or carefully survey these vessels he would undoubtedly answer NO to any suggestion of scrapping. The machinery, main engines, boilers and auxiliaries as well as the hulls proper are in a wonderfully well preserved condition; the accommodations in general and the various systems only being in such bad condition as to necessitate complete renewal. The necessity to balance our merchant fleet with vessels of this class together with the fact that these particular ones, so far as the essential vitals are concerned, are suitable for service should preclude serious consideration being given to the suggestion to scrap them.

SHALL THEY BE SOLD?

The market at this time for the sale of these vessels is primarily a foreign one. If sold abroad, they would undoubtedly go to German interests who would recondition and place them in direct competition with the United States Lines. In fact, a high official of the North German Lloyd Line has stated that apart from the great differential in reconditioning and operating costs here and abroad that company would, if given the opportunity, waste no time in getting the vessels into active service. For proof of this the reader is referred to what occurred to the S.S. *Pocahontas*, now known as the S.S. *Bremen*.

SHALL THEY REMAIN INACTIVE?

It is well known that a vessel in lay-up in spite of extreme care depreciates much more rapidly than when in service. The *Agamemnon* and *Mount Vernon* have been excellently cared for in lay-up until some time ago when the personnel aboard them was very materially reduced as a measure of payroll economy. For reasons of offsetting rapid depreciation and eliminating lay-up costs the vessels should not be continued in their present state.

SHOULD THEY BE RECONDITIONED?

The proposal implied by the Shipping Board's resolution to ask Congress to appropriate funds for the building of two vessels to be used in lieu of the *Agamemnon* and *Mount Vernon* would be a very creditable one from the viewpoint of having thoroughly American vessels of more modern proportions and construction were it a certainty that Congress would make this appropriation. If the attitude of Congress toward the merchant marine is properly sensed, there appears to be very little likelihood of its voting funds for additional governmental construction.

Prior to the Shipping Board's resolution an anonymous argument against the reconditioning of the *Agamemnon* and *Mount Vernon* in favor of the building of new vessels was made by a private owner who evidently was not familiar with the provision of the Jones Act prohibiting the board from constructing new vessels from their funds. This same act makes provision for a construction fund from which private American owners contemplating building new vessels can obtain loans at a reasonable interest rate to enable them to finance their projects and to promote construction. It is worthy of note that up to date no owner has made application for moneys from this fund to build vessels of the type under discussion whereas many vessels have been reconditioned.

Now then, if the *Agamemnon* and *Mount Vernon* should

neither be scrapped, sold nor continued in lay-up, they should necessarily be reconditioned, having in mind reasonable expenditures for this purpose. The factors in favor of reconditioning them may be briefly stated as follows:

1. The crying need for the addition of these or similar vessels for the United States Lines.
2. The fact that new vessels will not in all probability be authorized by Congress; also that, if authorized, at least three years will elapse before these new vessels could be placed in service.
3. The good condition of the vessels, their suitability for the service, as well as their availability for next year's passenger season, if promptly and properly reconditioned.
4. With present first costs, a considerably greater return could be had on the reconditioning investment than on investments in new tonnage.

SUITABLE RUNNING MATES OF THE GEORGE WASHINGTON

Can these vessels with their limitations in size, spaciousness and loftiness ever be considered comparable running mates of the *Leviathan* no matter how much money be expended on them? It would seem, therefore, that these vessels should be reconditioned for running mates of the *George Washington* having first, second and third class passenger accommodations. By removing from each vessel two of the engines, auxiliaries, certain boilers, uptakes and the forward and after funnels and converting from coal to oil burners, a service speed of 18 knots may be had. Reducing the power makes available additional cubic and deadweight for the carriage of oil fuel and is favorable for effectively dealing with any question of stability, no expensive "bulges" or "blisters" being required. The economy of operating at 18 knots instead of 22½ knots should be apparent.

EACH SHIP COULD BE RECONDITIONED FOR \$3,000,000

With this arrangement nothing like \$16,000,000 would be expended in reconditioning, an estimate of \$3,000,000, exclusive of steward's equipment, for each vessel would surely be an outside figure of cost at prevailing prices. Any estimate of operating costs which is based on similar ships would show a substantial net revenue after deducting all items, including insurance, interest on investment and a high rate of depreciation, fully justifying reconditioning the vessels as outlined. Fig. 1 illustrates the graceful general character of the vessels after they have been reconditioned on this basis.

Powerful Windlass Built for Submarine Tender

FOR installation on the United States submarine tender *Holland*, which is being built at the Puget Sound Navy Yard, Bremerton, Wash., the Hadfield-Penfield Steel Company has recently completed at its Willoughby (Ohio) works a windlass of sufficient size and power not only to handle regular 2¾-inch Navy standard chain but also to lift the tail of a fleet submarine sufficiently out of the water for the replacement of a propeller if necessary.

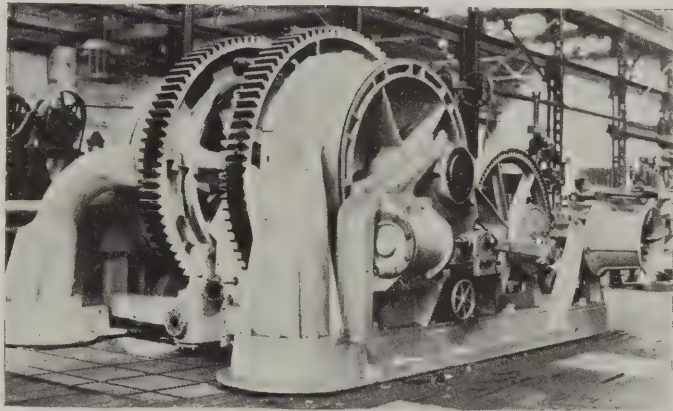
PULL OF 1,000,000 POUNDS REQUIRED

When the design of the windlass was undertaken it was found that for the latter purpose the windlass would have to exert a pull of 1,000,000 pounds but in order to get a windlass that would exert a direct pull of this magnitude it was found that the machine would be too large for use on the vessel and, therefore, the designer suggested to the Navy Department that the chain could be led from the wildcat out through the hawser pipe and around a large sheave and then the end of the chain made fast to the bow of the vessel, the

sheave to be fitted with a hook to which the chain which was fastened to the submarine would be attached. By this arrangement the actual pull exerted by the windlass would be practically one-half that required to lift the submarine as the sheave would make a 2 to 1 purchase.

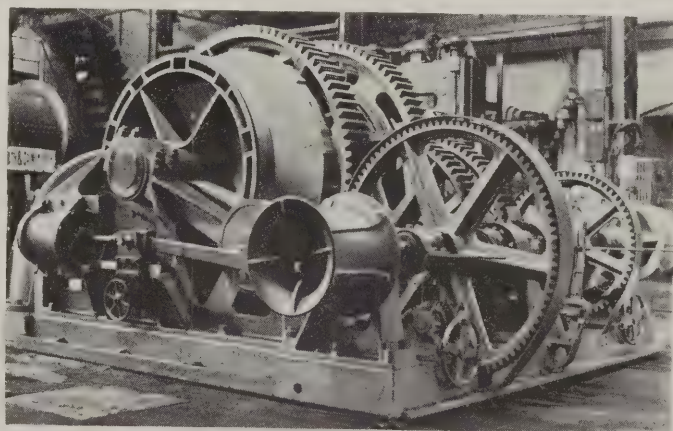
A windlass for handling 2¾-inch chain generally exerts a pull on the chain of about 86,000 pounds when used only for handling the anchor but it will be noted that this windlass must exert a pull on the two chains of something over 500,000 pounds which necessitated designing a special windlass having a ratio of gearing sufficient to produce the required pull.

As built, the windlass has 12-inch by 13-inch double cylinders with cranks set at 90 degrees and the gearing is so



Forward End of Windlass Showing Chain Pipes

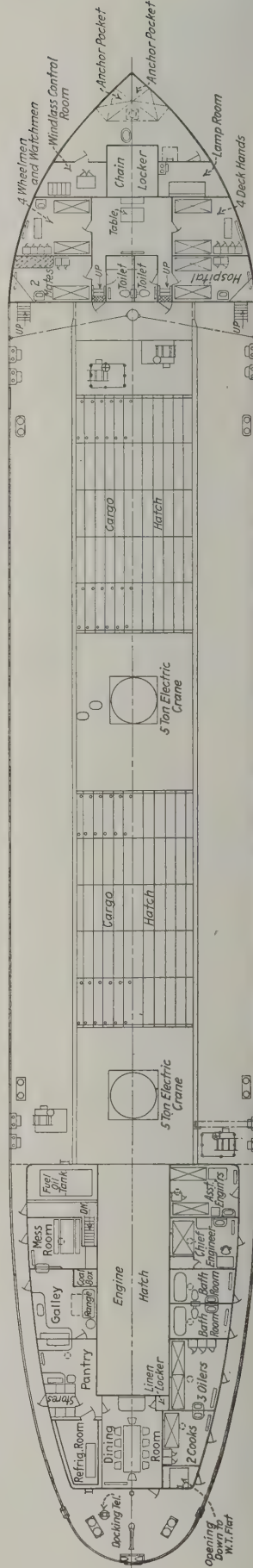
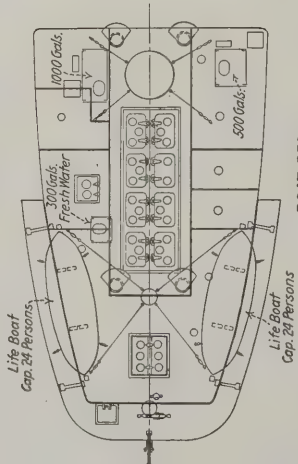
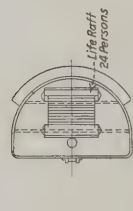
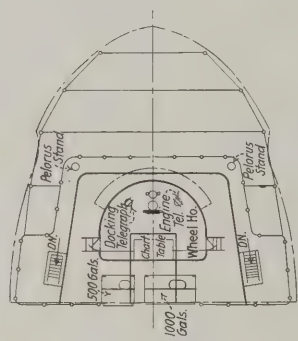
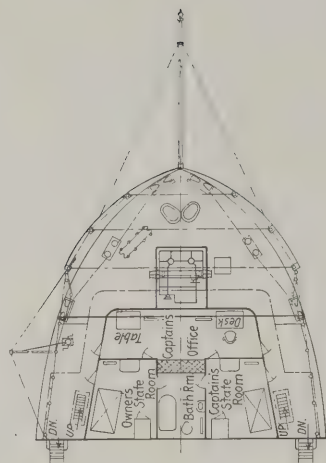
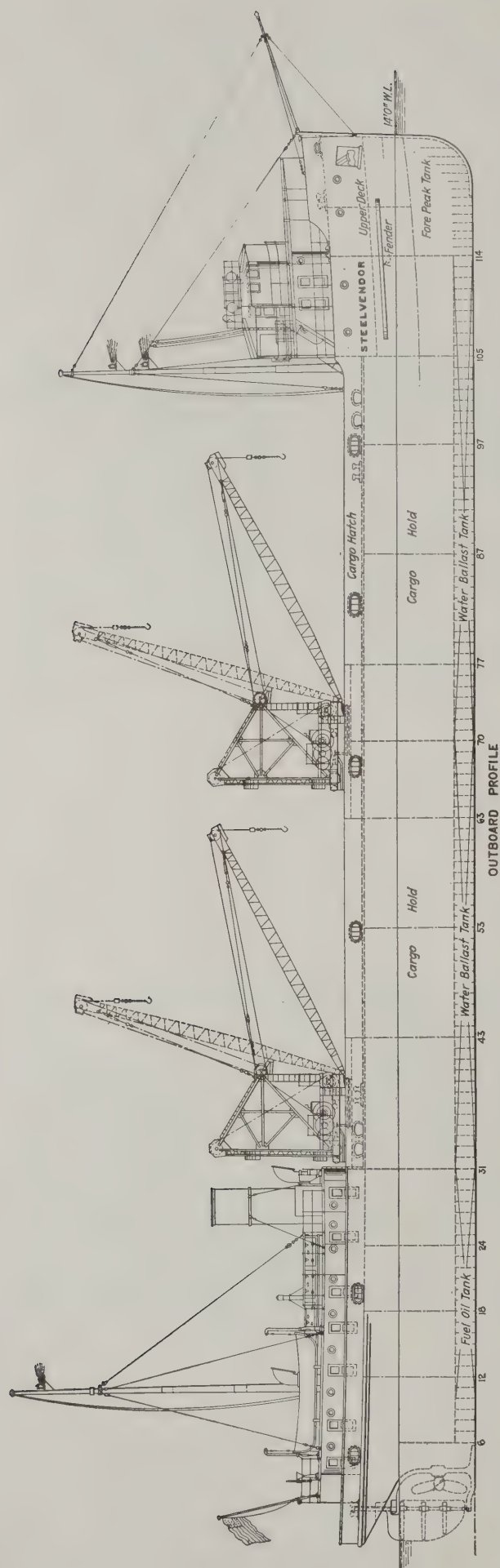
arranged that by operating through one set of gears the anchors can be hoisted at the usual rate of speed while by means of clutches this set of gearing can be thrown out of use and another set brought into play which gives the required pull of 500,000 pounds at a very low speed for lifting the tail of a submarine out of water. The overall length of the windlass is 18 feet 1½ inches; the overall width, 16 feet 9¾ inches; the height from the deck to the top of the main gears, 8 feet 4 inches, and the height from the deck



View of Windlass Showing Wildcats and Gearing

to the center of the wildcat shaft, 5 feet. The net weight is 97,800 pounds.

From the illustrations it will be noted that the chain from the hawse pipe passes first under and then around and over the wildcat and down through the chain pipes, to the chain lockers below, as shown on the forward end of the windlass. This is contrary to the usual practice where the chain generally passes over the wildcat and down through the chain pipes directly under the wildcat.



General Arrangement Plans of Motorships Steelvendor and Steelmotor



M. S. Steelmotor Built for Isthmian Steamship Company by Federal Shipbuilding Company for Lake and Coastwise Service

Motorships for Both Lake and Coastwise Service

Federal Shipbuilding Company Delivers Two Diesel Engine Driven Lake Freighters Equipped with Special Revolving Cargo Cranes—Will Be Used on Coast During Winter

TWO motorships, the *Steelmotor* and *Steelvender*, designed primarily for service on the Great Lakes and St. Lawrence river, but adapted also for use in the coastwise trade during the winter months, have recently been

completed by the Federal Shipbuilding Company Kearny, N. J., for the Isthmian Steamship Lines. These ships were originally intended for the Pittsburgh Steamship Company, of Cleveland, O., but were taken over by the Isthmian Lines, who opened an office in Cleveland for their operation.

The vessels are of the single deck type with raised forecastle, straight stem and elliptical stern. The hulls are built on the transverse system of framing and have a complete double bottom from peak to peak which is utilized for carrying fuel oil and ballast.

Four watertight transverse bulkheads are fitted and the deck is trunked. The vessels were built to American Bureau of Shipping classification A1-E to meet the requirements for both coastwise and lake service. The principal dimensions are as follows:

PRINCIPAL DIMENSIONS

Length overall	258 feet 3 3/8 inches
Length between perpendiculars.....	250 feet
Beam, molded	42 feet 9 inches
Depth, molded to upper deck.....	20 feet
Load draft, canal service.....	14 feet
Load draft, coastwise service.....	16 feet

Amidships, the hull is divided into two large cargo holds which are free of all obstructions as no stanchions are fitted. Compensation for the lack of stanchions is made, however, by three deep web beams in each hold. The bilge brackets

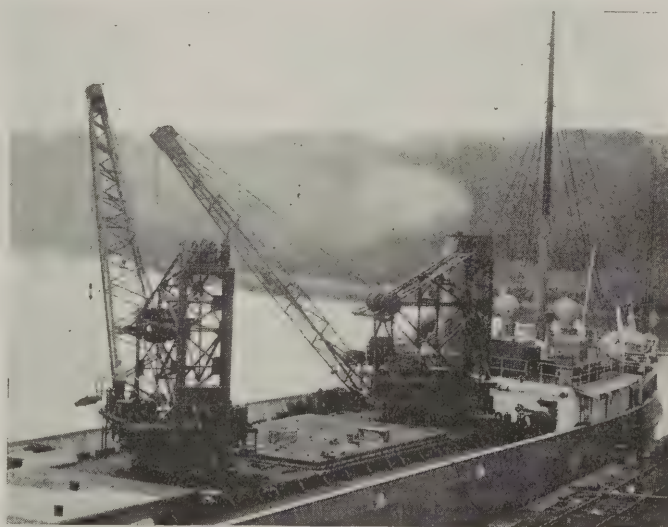
in the holds are protected from drainage by a double bottom ceiling and the double bottom plating of 1/2-inch plate, is all flush with seam straps which will make a smooth surface for handling the steel products of which the cargo will be made up. The deck is also specially designed to carry a deck load of steel.

Each cargo hold has an exceptionally large hatch for a vessel of this size, the dimensions being 40 feet by 20 feet. The large holds are fitted so that rails and other steel products up to 65 feet in length can be handled in each hold.

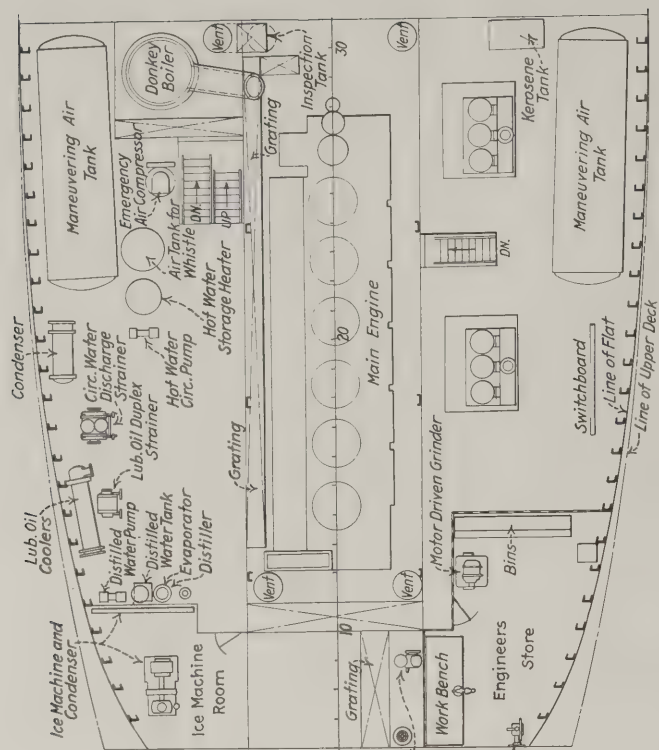
To facilitate the rapid handling of cargo, each of the hatches is served by a

5-ton, 3 motor, variable-radius, fixed-base, revolving crane supplied by the Brown Hoisting Machinery Company and installed at Cleveland. In service these cranes have handled about 100 tons of finished steel products an hour. They have a capacity of 10,000 pounds on a single line with a lifting speed of 130 feet per minute with a 50-foot radius. The maximum hoist under operating conditions is 65 feet.

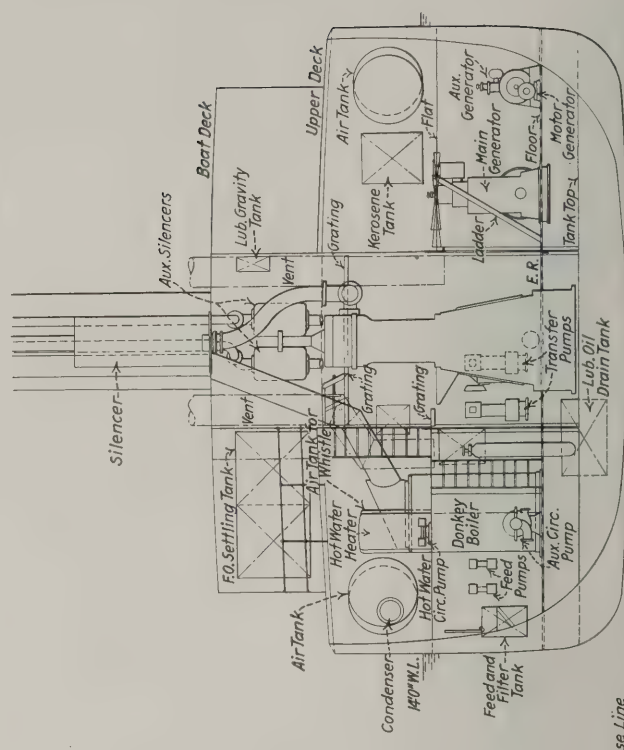
The cranes are equipped with Diehl motors operating on 240 volts direct current, the hoisting motor is of 50 horsepower, the rotating motor of 25 horsepower and the boom



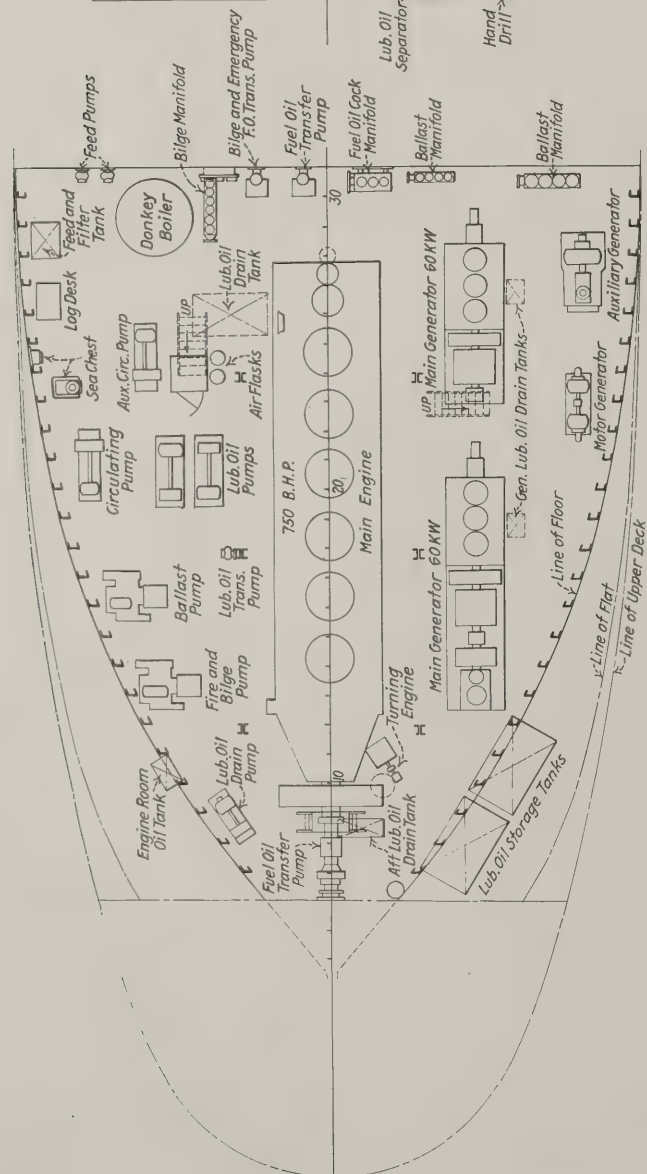
For Rapid Handling of Cargo Electric Revolving Cranes Are Installed on Deck



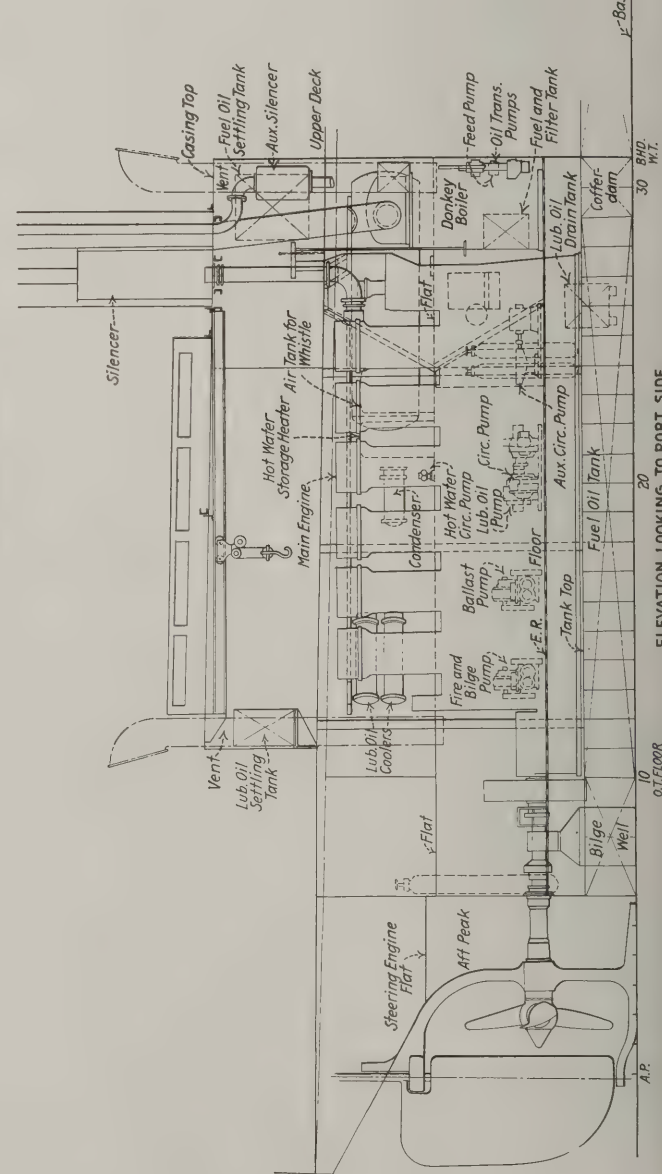
PLAN AT FLAT



SECTION AT FRAME NO. 20 LOOKING FORWARD



PLAN AT ENGINE ROOM FLOOR



ELEVATION LOOKING TO PORT SIDE

motor of 15 horsepower. The hoisting and boom controllers are arranged for dynamic braking when lowering, the rotating motor is braked dynamically in both directions.

One special feature of the cranes is the method by which the booms are stayed on deck. Counterweights are lowered to the bottom of the shaft, unhooked and the boom lowered by means of the lines to the deck. The operation is accomplished rapidly when the vessel is being made ready for use.

Loading and unloading conditions, chiefly in Montreal, are given as the principal reason for the installation of these cranes.

DECK MACHINERY ELECTRICALLY DRIVEN

Power for the deck machinery and motor-driven auxiliaries is furnished by two 60-kilowatt Diehl generators driven by Worthington Diesel engines designed to develop 90 brake horsepower at 375 revolutions per minute. One of the generators is connected with an auxiliary Worthington 3-stage air compressor through a Cutler-Hammer magnetic clutch. Electric current for lighting purposes while the vessel is in port and the main generators are shut down is furnished by a 5-kilowatt Diehl generator driven by a Mianus kerosene engine. Two sets of navigating lights are permanently installed, one for use on the Great Lakes and the other for use on the coast.

All of the deck machinery in addition to the revolving cargo cranes is electrically operated, including a Hyde spur gear windlass and four Hyde mooring winches, installed for facilitating the handling of the ship in the Welland Canal and the locks of other canals. A special quadrant-type steering gear is being tried out on one of the vessels while the other is fitted with the regular hydraulic gear with the follow-up gear motor driven. An electrically-driven $\frac{1}{2}$ -ton Brunswick ammonia ice machine cools the refrigerating spaces.

PROPELLING MACHINERY

As is the custom in lake freighters, the propelling machinery is located aft. In the case of these vessels it consists of a McIntosh and Seymour four-cycle, six-cylinder Diesel engine designed to develop 750 brake horsepower at 135 revolutions per minute, direct connected to the propeller shaft. This power is designed to give the vessel a speed of about 9 knots at a 14-foot draft.

The main engine is of the trunk piston type with cylinders 22 inches in diameter and 32 inches stroke. The thrust bearing is of the Kingsbury type and the propeller is of the 4-blade built-up type of manganese bronze 10 feet diameter by 8 feet pitch.

The lubricating oil system is of the pressure type with a gravity tank provided for gravity lubrication to the bearings. The oil drains from the main engine to a drain tank located in the inner bottom. Two Worthington motor-driven rotary gear pumps each having a capacity of about 125 gallons per minute draw the oil from the drain tank through separate strainers and discharge it through a duplex strainer and two Griscom-Russell multi-whirl oil coolers to the main engine pistons.

Oil for the gravity tanks for bearing lubrication is taken from the pressure system through a valve suitably adjusted to maintain the proper pressure and flow. A settling tank and a De Laval motor-driven oil purifier of about 100 gallons per hour capacity are provided for settling and filtering the oil.

The following tanks are provided for the lubricating oil system:

- Two 300-gallon storage tanks.
- One 300-gallon drain tank.
- One 300-gallon settling tank.
- One 30-gallon gravity tank.
- Two 30-gallon drain tanks for main generator engines.
- One 5-gallon drain tank for emergency generator engine.

Fuel oil is supplied to the fuel oil pumps on the main engine by gravity through a duplex strainer from two 3-ton daily service tanks on the main deck level. A vertical simplex piston pump is provided and so piped that fuel oil may be pumped to or from any fuel oil double bottom tank or service tank.

Injection air is supplied at a pressure of 1,000 pounds per square inch by the attached compressor on the main engine, or the auxiliary compressor—driven by the after main generator engine, or, in emergency, by a Worthington emergency two-stage compressor.

Maneuvering air at 350 pounds pressure is supplied from the excess from the injection air system and by the auxiliary compressor. The air is stored in two maneuvering air tanks each having a capacity of about 250 cubic feet, giving a total capacity sufficient for about 30 starts of the main engine.

ENGINE ROOM AUXILIARIES

The main pumps are motor driven and comprise the following:

- One Worthington ballast pump, horizontal duplex, 7 inches by 6 inches.
- One Worthington fire and bilge pump, horizontal duplex, 7 inches by 6 inches.
- One Worthington circulating water pump, centrifugal, 4 inches.
- One Worthington auxiliary circulating water pump, centrifugal, 2 inches.
- Two Worthington rotary lubricating oil pumps, $4\frac{1}{2}$ -inch suction.
- One Northern Fire Apparatus Company rotary lubricating oil drain pump, 2-inch suction.

All except the lubricating oil pumps are connected to the ballast system and permit ballasting the vessel in a short time. The lubricating oil pumps are of large capacity to offset the piston cooling of the main engine by lubricating oil.

As the vessels are to be used in coastwise service during the winter months, the bilge and ballast systems are arranged for both fresh and salt water service. The other machinery is also suitable for use on either salt or fresh water.

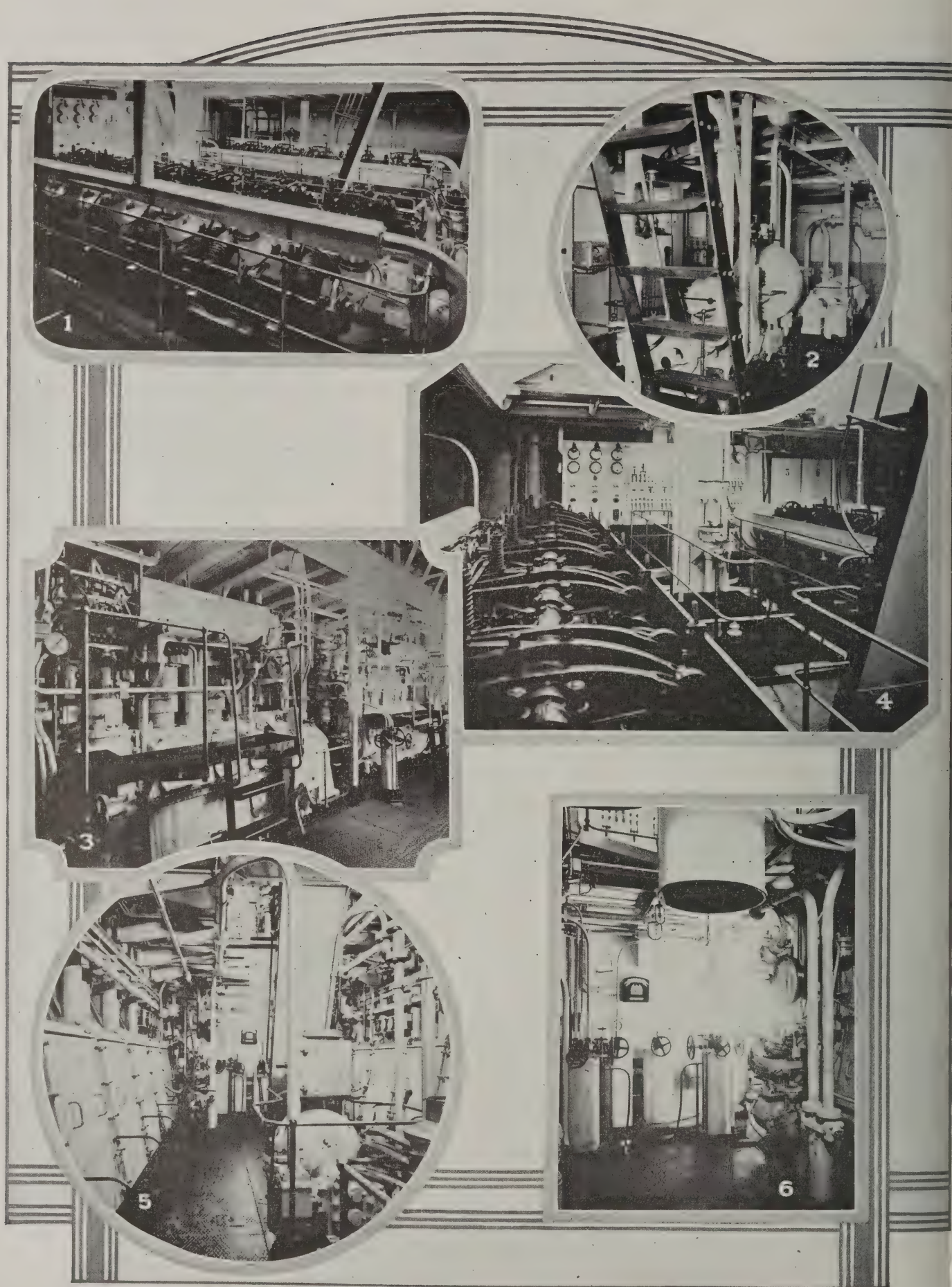
The remainder of the pumps are of the piston type operated by steam or compressed air. These are all of Worthington make and include:

- One horizontal duplex distilled water pump, 3 inches by 2 inches by 3 inches.
- One horizontal hot water circulating pump, 3 inches by 2 inches by 3 inches.
- Two vertical duplex donkey boiler feed pumps, 3 inches by 2 inches by 3 inches.
- One vertical duplex lubricating oil transfer pump, 3 inches by 2 inches by 3 inches.
- One vertical simplex fuel oil transfer pump, $6\frac{1}{2}$ inches by 7 inches by 8 inches.
- One vertical simplex bilge and emergency fuel oil transfer pump, $6\frac{1}{2}$ inches by 7 inches by 8 inches.

An oil-fired donkey boiler with 355 square feet of heating surface is provided to furnish heat and hot water for the living quarters. The donkey boiler stack and Diesel engine exhaust pipes are located in a single smokestack above the machinery space.

The other auxiliaries include a White Fuel oil strainer, an Elliott lubricating oil discharge strainer, an Elliott circulating water strainer, a two-pass surface condenser with 75 square feet of cooling surface, a hot water storage heater, two Griscom-Russell lubricating oil coolers, a Griscom-Russell distilling set, a DeLaval lubricating oil purifier, a Schutte & Koerting injector and an oil burner for the donkey boiler. An extra large ballast line is used in the double bottom tanks. The mechanical telegraph is of a special lake type with an alarm attachment to notify both the captain and the engineer if a mistake is made in the signals.

Quarters for the deck crew are located in the forecabin, the captain and owner have staterooms in the forward deck house and the engine room crew and stewards' department are quartered in the deck house aft on the upper deck.



M. S. Crux: (1) Tops of Main Engines; (2) Starboard Side of Engine Room; (3) Auxiliary Engines; (4) Upper Engine Room Platform, Looking Forward; (5) View Between Main Engines; (6) Maneuvering Platform



Motorship Crux, of 6,500 Tons Deadweight, Equipped with Burmeister & Wain's New Type Engines

Europe Developing New Types of Diesel Engines

**Manufacturers Carrying Out Experimental Work on Double Acting,
High Speed and Compressorless Types of Engines**

By Our Special London Correspondent

WHEN it is mentioned that some 40 percent of the orders placed for ships in Europe during the past six months are for vessels equipped with internal combustion engines, it will be gathered that shipowners are rapidly becoming convinced of the suitability of motor craft for their various trades. It is a notable fact, however, that Diesel engine manufacturers, even those whose motors have proved their complete success at sea, are all carrying out much experimental work, with a view to developing new and improved types.

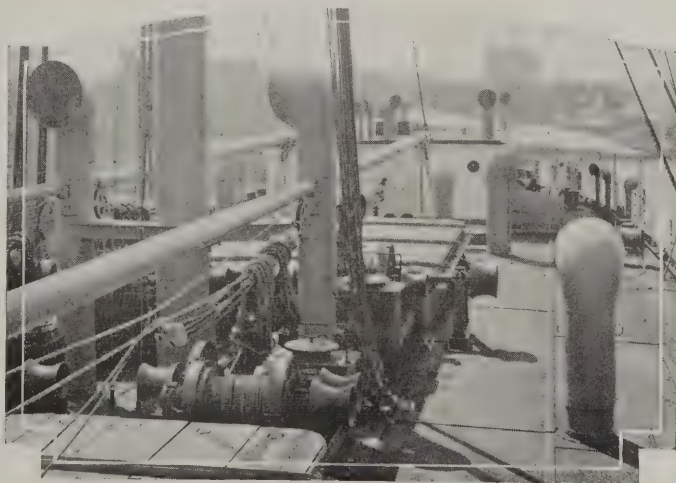
It is now a much-debated point in shipping circles whether for vessels up to about 10,000 tons deadweight, single or twin-screw machinery should be utilized. The tendency is undoubtedly towards the employment of one engine, with the consequent saving in cost and upkeep, but some owners still join in their faith to the twin-screw plant.

For such purposes, Burmeister and Wain have re-

cently developed what they term a light engine, examples of which are to be seen in the 6,500-ton motorship *Crux* which they have just built for the Bergen Steamship Company. Apparently with this design they have succeeded in reducing the weight of the machinery to a considerable extent, for the two main engines each of 1,150 indicated horsepower weigh only 162 tons combined. Such a result is only achieved by adopting the high speed of 145 to 150 revolutions per minute but it also has the result of reducing the length of the engine room to 35 feet. The weight given, of course, excludes the auxiliary machinery, shafting, piping, ladders, etc., which bring the total engine room weight up to 312 tons.

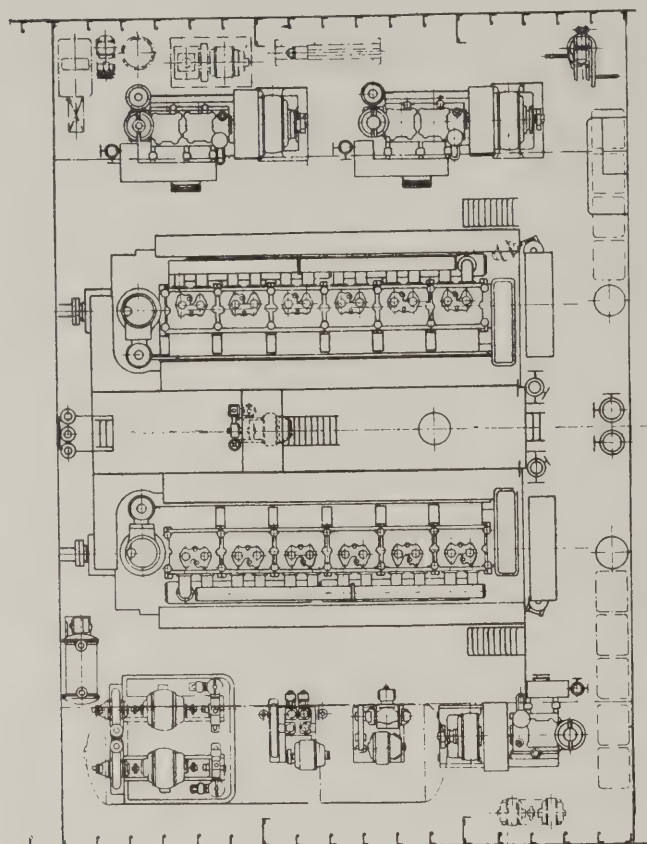
APPEARANCE OF ENGINE CHANGED

In this new engine, the builders have greatly modified the distinctive appearance of the standard Burmeister and Wain design. The camshaft has been raised



Deck View Showing Electrically Driven Winches

to the level of the cylinder cover, enabling the valves to be operated direct, instead of long vertical push rods being necessary. This has involved a modification of the camshaft drive and all the engine controls have been removed from the center



Plan of Engine Room

of the engine to one end, a similar alteration being effected with the fuel pumps.

DETAILS OF THE VESSEL

The *Crux* has been built to Lloyd's special survey to class 100 A. 1, shelterdeck, according to the requirements of the Norwegian Laws. The principal dimensions are as follows:

Length, overall	382 feet 0 inches
Length between perpendiculars	367 feet 0 inches
Breadth, molded	51 feet 3 inches
Depth, molded to shelterdeck	34 feet 0 inches
Depth, molded to upperdeck	25 feet 6 inches
Height of double bottom	46 inches
Draft, loaded	23 feet 2½ inches
Displacement	about 9,700 tons
Gross tonnage	about 3,828 registered tons
Capacity of holds	about 403,000 cubic feet, grain
Capacity of holds	about 373,000 cubic feet, bales
Water ballast	about 1,210 tons
Total capacity of fuel	about 1,100 tons
Indicated horsepower, normal	about 2,100
Fuel consumption per 24 hours	
normal	6.5 tons

The ship is built with three complete steel decks, six watertight compartments and double bottom, the double bottom being fitted for the carriage of either fuel oil or water ballast. In a large deckhouse amidships are accommodations for the officers and a limited number of passengers while the crew's quarters are aft.

Electric radiators are fitted for heating the accommodations. For fire extinguishing an apparatus on the A. S. Lux CO₂ system is fitted with pipe connections to all the cargo holds, thus avoiding the use of an auxiliary steam boiler.

CARGO HANDLING FACILITIES

The vessel carries two masts and is provided with ten 5-ton derricks served by eight 3-ton winches. In addition two 5-ton winches are fitted aft and equipped for warping purposes. The winches are all electrically driven, and have been supplied by the Allmänna Svenska Elektriska Akto. The steering gear, which is of Brown Brothers make, is of the electric hydraulic type and is controlled from the bridge by means of a telemotor. The windlass is supplied by Clarke, Chapman and Company and is also electrically driven.

The main engines of the *Crux* are normally rated to develop 2,300 indicated horsepower at 145-150 revolutions per minute but owing to the low speed of the *Crux*, desired by the owners, the indicated horsepower was in this special case reduced to 2,100 at about 130 revolutions per minute.

The daily fuel oil consumption is 6-6⅛ tons, giving the vessel a cruising radius of about 45,000 sea miles.

AUXILIARIES

All the auxiliary machinery in the engine room, as well as the deck machinery, is electrically driven, the current being supplied by three dynamos, one of 33 kilowatts and two of 66 kilowatts driven respectively by one single cylindered and two twin cylindered auxiliary Diesel engines designed and constructed by Burmeister and Wain. The current for power purposes is supplied at 220 volts, but for lighting and heating purposes this is transformed down to 110 volts by means of a motor generator.

Any one of the dynamos is sufficient to supply the necessary current required for normal working at sea, but two, or even all three, have to be in operation when the vessel is maneuvering in and out of harbor with the maneuvering compressor running or when loading and discharging cargo.

The machinery weights are as follows:

Main engines	162 tons
Auxiliary engines	35 tons
Auxiliary machinery	8.5 tons
Reservoirs	20 tons
Shafting, complete with all accessories including reserve propeller	41 tons
Ladders, grating, floor plates, lifting gear, spare parts, engine room ventilators, telegraph gears, special tools, etc.	20 tons
All piping clear of engine and including bilge and ballast piping, bottom valves, etc.	18 tons
All electrical material inside engine room	3.5 tons
Water in pipings	4 tons
Total	312 tons

TRIAL TRIP

The trial trip of the *Crux* was run on July 9 in the Sound at Copenhagen, when a mean speed of 10.94 knots was obtained with a fuel consumption of 0.284 pound per indicated horsepower hour, the net calorific value of the fuel used being 18,100 British thermal units per pound. The fuel consumption given above includes the consumption of the auxiliary engines producing the necessary current for driving the auxiliary machinery, the steering gear and the electric light.

Another new engine, which the same builders have just developed, is one specially designed for the propulsion of large yachts. The first example is seen in Mr. Edward Hutton's fine 800-ton yacht *Hussar* which is described elsewhere in this issue.

A NEW HIGH-POWERED SUBMARINE ENGINE

An interesting development has recently been made by the Fiat Company of Turin, who have purchased the Ansaldo San Giorgio Company's Diesel engine works. A two-cylinder experimental submarine engine has been built developing 1,000 brake horsepower or 500 brake horsepower per cylinder.

It is of the two-cycle type with controlled port scavenging, and its main peculiarity lies in the fact that it is almost wholly of cast steel, except for cylinder liners, pistons, connecting rods, crankshaft and camshaft. It runs at about 350 revolutions per minute and is claimed to have a remarkably low weight to power ratio. The only valve in operation in each cylinder is the centrally-placed fuel inlet valve, apart from the scavenge control valve which prevents the scavenging air being admitted to the cylinder, until the exhaust ports have been partially uncovered by the piston in the course of its downward stroke.

The builders will utilize a somewhat similar design in their mercantile engine of the slow speed type and, with extensive employment of cast steel for the engine crank chamber, cylinder jackets and cylinder covers, has attracted considerable attention, since the tendency has of late been towards the exclusive employment of cast iron for this purpose.

The Fiat Company is about to build its first experimental double-acting two-cycle engine on which plans are now well advanced, and incidentally it may be added that at least half a dozen of the leading Diesel engine manufacturers are now engaged upon this problem. The British Admiralty is experimenting with a double-acting two-cycle motor of high power, with the object of its employment for submarine work.

NEW ENGINE PLACED ON MARKET

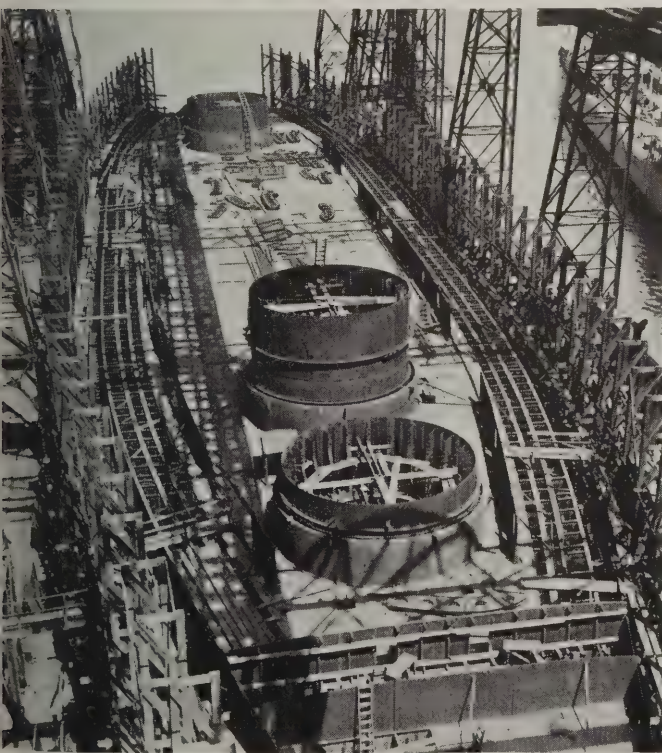
After a period of prolonged experiments, a new type of Diesel engine has been placed on the market by Sulzer Brothers which, however, is not intended to replace their ordinary design but is only being built in sizes of 200 brake horsepower and under. It operates on the two-cycle principle and employs crank chamber compression, although the 200 horsepower four-cylinder size is built alternatively with separate scavenging pumps. The main point of importance in the design is the elimination of the injection air compres-

sor. A mechanically operated pump delivers the fuel to a special type of valve in the cylinder head. This is automatic so that there are no mechanically operated valves, while the fuel pump works at low pressure, since the oil is delivered to the valves at the commencement of the compression stroke. This engine on trials has shown a fuel consumption of about 0.41 pound per brake horsepower hour, which is equal to that achieved with much larger motors of ordinary design. The cost of manufacture is considerably less than that of the air injection type, and although it is stated that there is no present intention of building it in large powers for the propulsion of ships, this possibility is by no means ruled out.

Another new Diesel engine is now being standardized by the A. E. G. Works in Berlin for installation in motorships built by the Deutsche Werft at Hamburg. This is virtually a long-stroke Burmeister and Wain design but is of high power, developing 3,000 brake horsepower in six cylinders. It is hoped to construct similar types with still greater output, but where powers of more than 4,000 brake horsepower are required on single-screw ships, no doubt the new Burmeister and Wain double-acting motor will be adopted.

Inland Waterways Prove Most Economical Means for Transporting Novel Shipment to St. Louis

A NOVEL shipment by water was recently made from the old Hickory Powder Plant at Jacksonville, Tenn., to St. Louis. Six immense tanks already erected at the Old Hickory Plant were purchased by the Monsanto Chemical Works for their Plant B in East St. Louis. As



Photograph by Kadel & Herbert, N. Y.

United States Battleship Indiana, Partially Completed at New York Navy Yard, Brooklyn, N. Y., Which Is About to Be Dismantled and Scrapped in Accordance with the International Disarmament Treaty



Tanks Loaded on Barge for Transportation on Western Rivers

these tanks have a diameter of 20 feet and a height of 12 feet, and weigh approximately 13 tons each, their size made it impractical to ship them by rail. It would first have been necessary to dismantle them and later reassemble them in their new location, incurring unnecessary expense. It was possible, however, to ship them by barge without dismantling them.

From the loading point the barge descended the Cumberland River through a series of locks to the Ohio, thence down the Ohio to the Mississippi, which it ascended to East St. Louis, where the tanks were unloaded and installed in their new locations.

THE BUREAU OF NAVIGATION, Department of Commerce, reports 84 sailing, steam, gas and unrigged vessels of 25,217 gross tons built in the United States and officially numbered during the month of August, 1923.



Three Masted Diesel Auxiliary Yacht Hussar IV Under Sail

Diesel Auxiliary Schooner Yacht Hussar IV

**Latest Addition to New York Yacht Club Fleet Built
Abroad from Designs by Cox and Stevens of New York**

ONE of the most interesting events of this year's yachting season was the arrival on this side of the Atlantic of the new three-masted auxiliary schooner yacht *Hussar IV*, designed by Messrs. Cox & Stevens, naval architects of New York, and built under their supervision by Messrs. Burmeister & Wain, of Copenhagen, Denmark, for Mr. Edward F. Hutton, of the New York Yacht Club.

Captain Carl G. Muller, who is in command of the *Hussar IV*, reported that on her trip across she encountered extremely heavy weather but that the new vessel proved herself an excellent seaboat, carried her sail well and made a very quick passage considering the conditions. The weather for the most part was unfavorable, heavy winds and rough sea being encountered, but notwithstanding this fact the voyage from Dover to New London was made in fourteen days, an excellent performance under the circumstances.

GENERAL CHARACTERISTICS

This new schooner is one of the largest auxiliary vessels in the New York Yacht Club fleet, her dimensions being:

Length overall	204 feet 6 inches
Beam	33 feet 0 inches
Draft	14 feet 6 inches
Displacement	826 tons
Indicated horsepower, auxiliary engine	900

She is equipped with a 900 horsepower Burmeister & Wain Diesel engine placed well forward of amidships and driving a two-bladed feathering bronze propeller which when folded

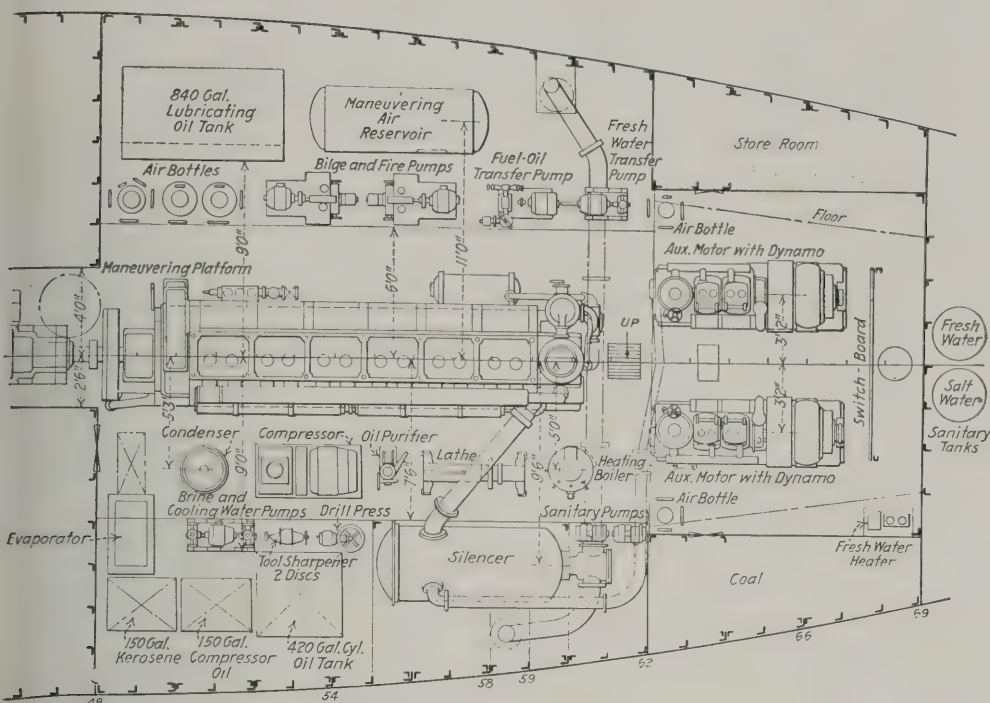
into its recess forms practically no obstruction to the speed of the yacht, but when in use can drive the vessel continuously at a speed in excess of 11 knots.

MAIN ENGINE

In order to reduce the weight of the engine, the speed has been increased to 300 revolutions per minute and the engine develops 900 indicated horsepower or about 700 brake horsepower. The camshaft is at the top of the engine with ahead and astern cams side by side. Reversal is effected by turning the shaft on which the valve levers are mounted, moving the camshaft fore and aft, and then bringing the valve lever again in contact with the cams, thus allowing the astern cams to come into action. The whole operation is effected automatically by a servo-motor controlled by means of a small reversing lever, and there are two further levers for starting and speed control. This engine is of the trunk piston type, the cylinders being carried direct on a box-form crankcase.

AUXILIARIES

The fuel tanks, located below the cabins aft, have a capacity of 64 tons of oil. The daily fuel consumption with the engine running at full speed is $2\frac{3}{4}$ tons for all purposes and the radius of action of the vessel is 7,000 sea-miles without using the sails. There are two auxiliary Diesel engines, each of 50 brake horsepower and driving a 33 kilowatt dynamo.



Plan of Engine Room

The other auxiliaries in the engine room comprise electrically driven bilge and fire pumps, fuel oil transfer pumps, fresh-water pumps, a single auxiliary maneuvering air compressor, sanitary, fresh-water, cooling and lubricating-oil pumps, in addition to which a small heating boiler is installed on the starboard side.

The electric light installation comprises about 400 lights, and there is a storage battery of 100 Edison cells, having a total capacity of 300 ampere-hours.

HULL AND RIG

In designing the hull for use on extended cruises, a flush deck vessel with clipper bow and moderate overhang aft was adopted, with a raised poop to provide a dry space on deck

foremast was stepped further aft than usual and four lower head sails are carried, an arrangement that has worked out extremely well. Although by no means under-sparred the masts of this vessel are of such a height that she can pass under the Brooklyn Bridge without sending down her topmasts, which is a valuable asset in the case of a vessel which will be used around New York waters.

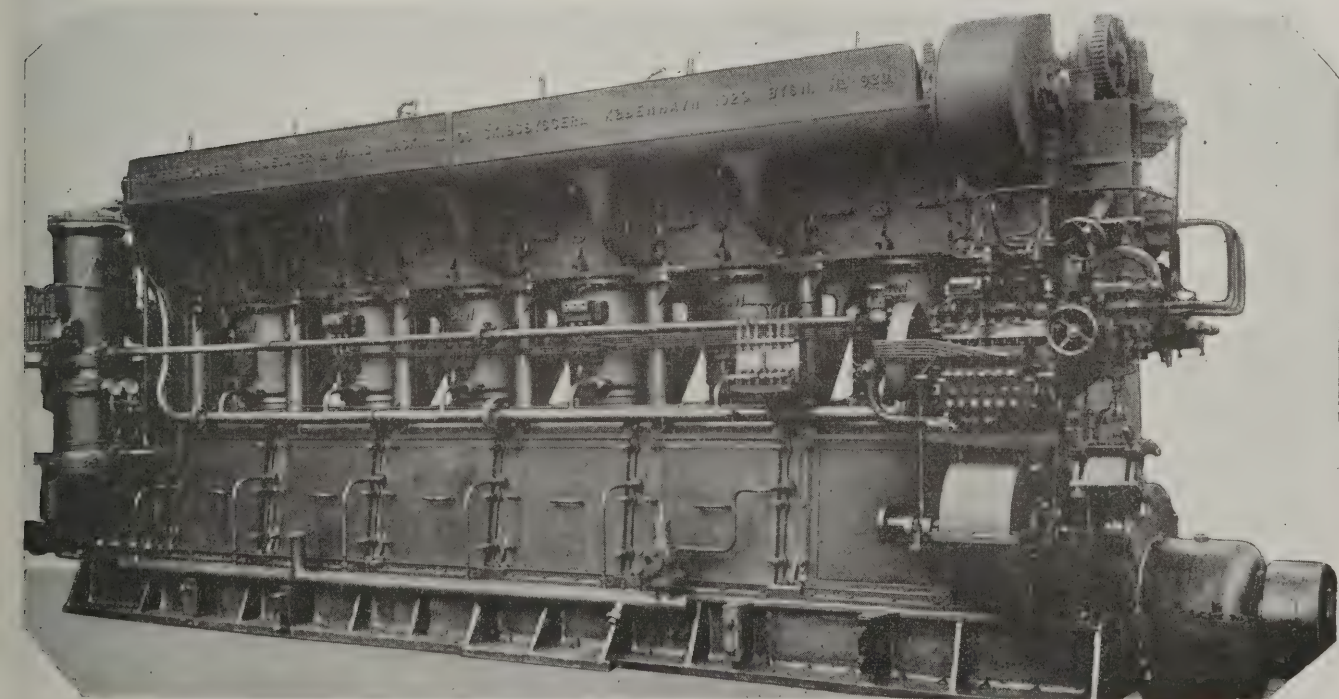
The weather deck is of heavy teak planking and the deck-houses, of which there are two, are also of teak, as are the rails, skylights and all other fittings of like character.

The after deckhouse starts at the break of the poop and forms a comfortable living room, affording also access to the owner's and guests' quarters on the lower deck as well as

(Continued on page 624)

for the owner and his guests when at sea in heavy weather. The proportions of the hull were selected with a view not only to comfort and seaworthiness, but also having in mind the serious disadvantage of excessive draft. With the very moderate draft of 14 feet 6 inches the *Hussar IV*, while having an excellent form for driving under sail as well as power, is able to enter any of the harbors which the owner expects to visit.

The vessel was built complete according to Lyold's highest classification for a rugged and substantial craft. The vessel is sparred as a three-masted schooner, having only a moderate sail plan but carrying sufficient canvas so as not to be sluggish when under sail. A rather unusual sparring arrangement was determined upon in order to reduce the size of individual sails, by which the



Six Cylinder Burmeister & Wain Diesel Engine Installed on Yacht Hussar IV

Telescopic Conveyor to Speed Up Vessel Loading and Discharging on Pacific Coast

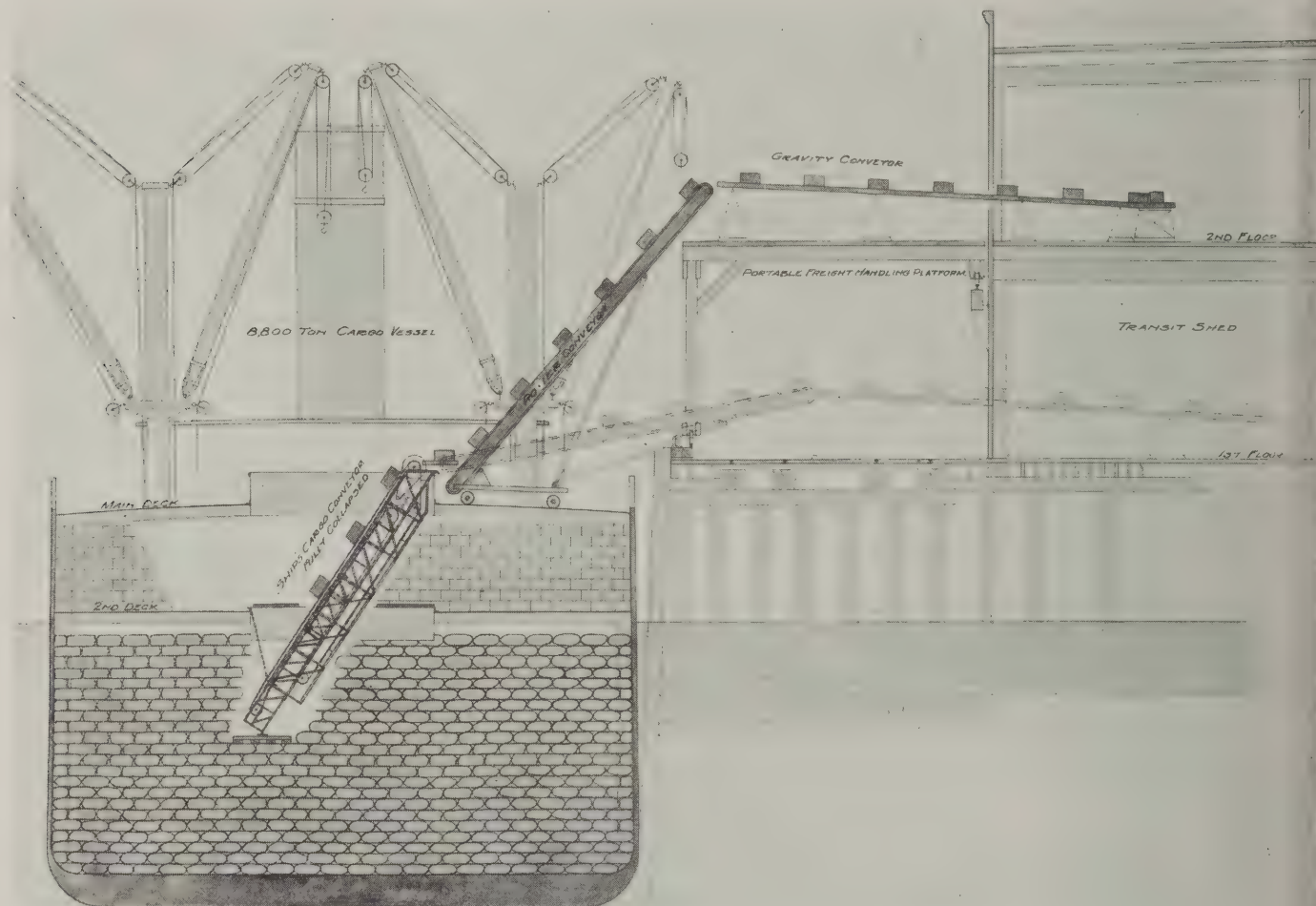
HANDLING cargo by the old method of ship's sling may be discarded for a new invention that is expected to revolutionize the handling of freight, in the opinion of the Port Commission of Seattle, Wash., whose chief engineer, George F. Nicholson, is the inventor of what is known as a ship cargo telescopic conveyor.

The Port of Seattle, in connection with its planning and construction program of its marine terminal system, has adopted the policy of providing these harbor facilities with

or at two ends and the center. The estimated weight is $3\frac{1}{2}$ tons and it can be easily handled by the ship's boom. The motor equipment consists of a 10 horsepower squirrel cage, 3 phase, 60 cycle, 440 volt, alternating current induction motor, running at 1,200 revolutions per minute. Silent roller chain drives are used for both conveying and telescoping conveyor.

LOADING CAPACITY DOUBLED

This equipment has a capacity of 125 tons per hour at a speed of 75 feet per minute and will double the capacity for loading and unloading vessels. With Seattle's present method of unloading canned salmon, for instance, the capacity averages 800 to 1,000 cases, while the new conveyor will handle 2,000 cases. It can handle boxes, bales and



Sketch Showing Application of Ship Cargo Telescopic Conveyor

the most modern and efficient mechanical handling appliances, and among this handling machinery will be found several specialized labor-saving devices which have been planned and constructed by the port's engineering department, headed by Mr. Nicholson. The latest equipment is a ship cargo telescopic conveyor, which is shown in the illustration.

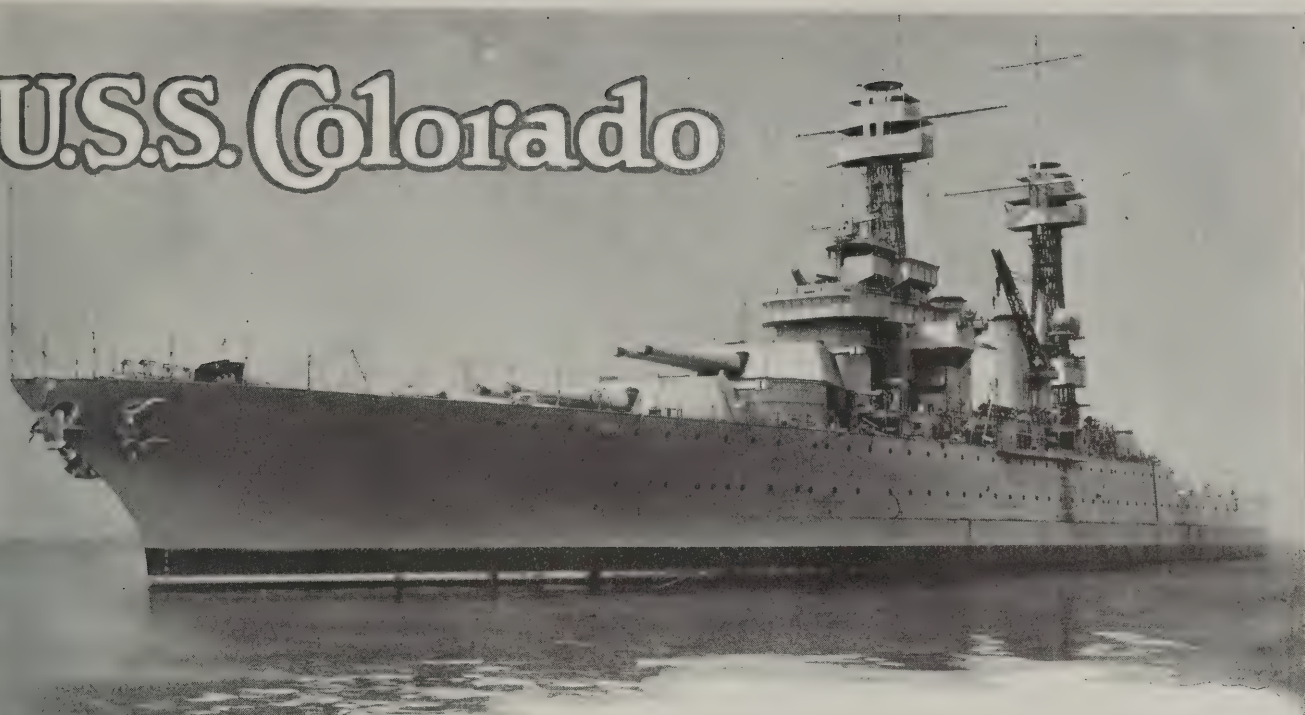
A CONVEYOR WITHIN A CONVEYOR

This equipment is actually a conveyor within a conveyor, it being lengthened by extending the interior conveyor, this being done not by man labor, but by power, which arrangement makes it very convenient and economical to operate. The length of this conveyor extended is 45 feet and the length collapsed, that is, with the extension raised to the highest point, is 29 feet—the width over all is 5 feet 6 inches, which shows that it is a very compact piece of machinery. It can be supported at both ends, or at one end and the center

sacked goods up to a maximum weight of 500 pounds and to a maximum size of $2\frac{1}{2}$ feet by 5 feet. The commodities that it is expected to handle are cased salmon, cased milk, in fact, cased goods of all kinds, including sugar, beans, rice, etc. In the case of bales over 500 pounds, such as gunny bales, also rattan, bamboo, bulky furniture, etc., these, of course, would be handled by the ship's boom, which can easily be done, as the conveyor only covers a small area of the hatch opening.

Another use that can be made of this type of conveyor is for transferring cargo from one portion of the transit shed to another, and from ship to transit shed and to the warehouse. The estimated cost of this equipment is \$2,400 per conveyor, including extension and full equipment. It is expected by the port of Seattle that this will revolutionize on the Pacific Coast the handling of freight from the ship's hold to the wharf and vice-versa, especially Oriental import cargo from the Far East.

U.S.S. Colorado



Electrically Propelled 21-Knot Battleship Colorado

THE U. S. S. *Colorado*, the fifth battleship to be equipped with electric drive, was commissioned for active service in the navy at the yard of the New York Shipbuilding Company, Camden, N. J., on August 30. The *Colorado* is a sister ship of the *Maryland* and the *West Virginia*.

*Capt. Belknap
Reading His
Instructions*

The newest addition to the navy has a length overall of 624 feet; breadth on waterline 97 feet, normal displacement 32,600 tons, the main engines being two 18,000 horsepower Westinghouse turbo-electric generators and four 8,000 horsepower Westinghouse motors, each connected to a propeller shaft. The ship will be an oil burner, developing a speed of 21 knots.

ARMAMENT

Like the *Maryland* and the *West Virginia*, the *Colorado* carries

eight 16-inch 45-calibre guns, mounted in four turrets. Her secondary battery for defense against destroyers, submarines and other light craft consists of twelve 5-inch 51-calibre guns. In addition, she carries two 21-inch submerged torpedo tubes and eight 3-inch high-angle guns for defense against aircraft. Her complement consists of 1,400 officers and men.

The vessel will be commanded by Captain Reginald Rowan Belknap, U. S. Navy, who recently served on the staff of the Naval War College at Newport, R. I.

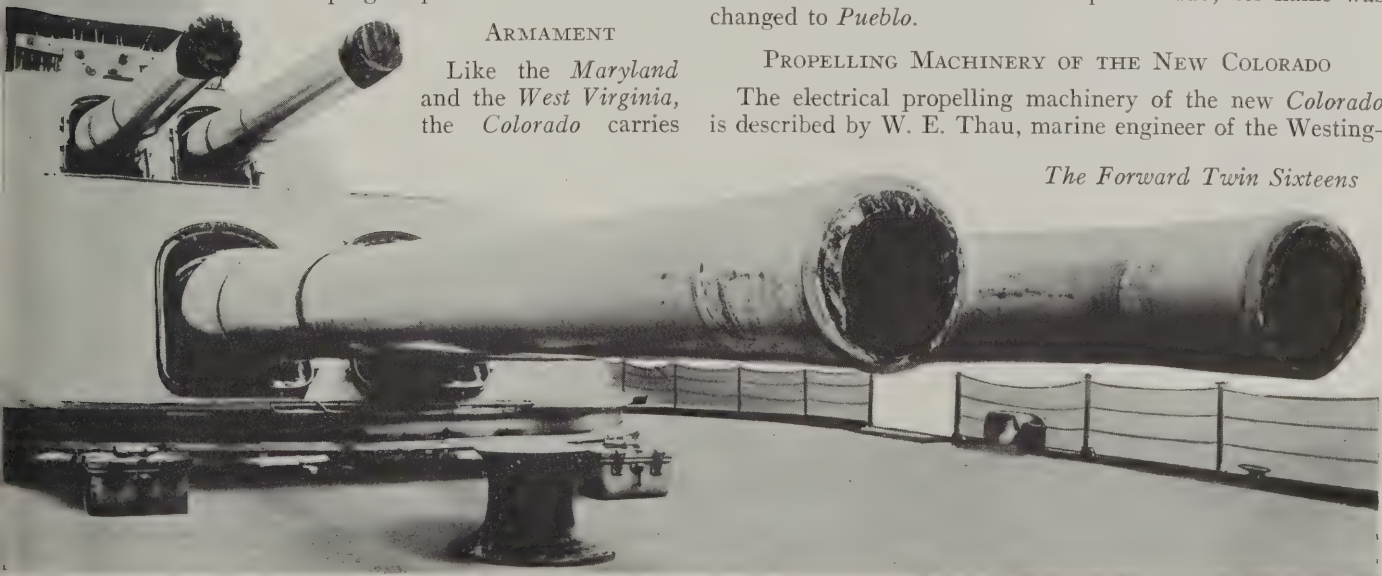
THE THREE "COLORADOS"

The new battleship *Colorado* is the third ship in the American Navy to bear that name. The first, named for the Colorado River, was a wooden steam frigate of 3,400 tons displacement, mounting 40 guns, launched at the Norfolk Navy Yard on June 19, 1856. The second was an armored cruiser of 13,680 tons displacement and 22 knots' speed with a main battery of four 8-inch guns launched at Cramp's Shipyard, Philadelphia, April 25, 1903. In 1916, with the authorization of the new battleship *Colorado*, her name was changed to *Pueblo*.

PROPELLING MACHINERY OF THE NEW COLORADO

The electrical propelling machinery of the new *Colorado* is described by W. E. Thau, marine engineer of the Westing-

The Forward Twin Sixteens



house Electric & Manufacturing Company, which supplied the machinery, as follows:

The four propellers are electrically driven by direct connected, two-speed, wound secondary, induction motors, supplied with power by two turbine generator sets. A battery of eight oil fired, watertube boilers supplies steam at 265 pounds gage to the turbines. All engine room auxiliaries necessary to the main propulsion, such as the main condenser circulating and condensate pumps, the auxiliary condenser condensate pumps, the lubricating and governor oil pumps, oil cooler circulating pumps, and the main motor ventilating blowers are electrically driven by direct current motors. The direct current for those auxiliaries necessary to the propulsion, as well as the excitation of the main generators is supplied from one of the three 300 kilowatt geared turbine direct current generating sets in each engine room.

The power generating machinery is located in two engine rooms, one being forward of the other, and both being forward of the control room. The turbine generators are mounted directly above the condensers. On the same flat with the main generators are mounted two 300 kilowatt geared turbine direct current condensing sets and one non-condensing set, all being of the 3-wire type, supplying electric power at 240 and 120 volts. The condensers with their auxiliaries are mounted on the lower machinery flat or pump room. The switchboards for controlling the 300 kilowatt sets are mounted at the ends of the engine rooms.

All control equipment and other apparatus necessary for the complete control of the propelling machinery is contained in the control room, which is located between the engine rooms and motor rooms. The *Colorado* is the first turbine electric driven vessel to have remote electric speed control. All operation incident to the maneuvering of the main turbines, except the actual starting when preparing to get under way, is done electrically from the control room. This is a very unique arrangement, in that it eliminates all mechanical and hydraulic connections between the turbines and the control station.

MAIN MOTORS

Each propelling motor is capable of delivering a maximum of 8,375 horsepower at a speed of approximately 185 revolutions per minute. The motors are of the induction type, and are wound for 2-speeds at full frequency, there being a 24 pole and a 36 pole winding. The primary or stator has two independent windings, one for each set of poles. The rotor has a 3-phase, two parallel, star-connected winding, having balancer connections operating as such on the 24 pole winding. The 24 pole winding is connected to three slip rings. When the stator is connected to the 36 pole

winding, the balancer connections form short-circuit paths for the rotor conductors, thus forming an ordinary squirrel-cage winding having straps instead of resistance rings to connect the rotor conductors together.

The design of the motors incorporates all special features required by marine service. The mechanical construction of the motor is of the self-contained type, in which the bearings are carried by suitable brackets which fit into recesses in the stator frame. The entire motor is supported by feet cast integral with the frame on either side. The bearing housings are adjustable radially by means of jack screws in the brackets, and, after being adjusted, are bolted rigidly to the bracket.

The ventilation is supplied by duplicate, direct current, motor driven, exhaust blowers, each capable of delivering a maximum of 12,500 cubic feet of air per minute. In addition to these separate blowers, the rotor of the motor is provided with fan vanes which assist in the ventilation, and which are capable of supplying sufficient air to enable operation for brief periods without the separate blowers. The separate blowers are mounted on top of the motors, and are arranged to draw the air through the motors and discharge it through suitable ducts to the deck.

To facilitate inspection and repair, suitable tracks and disassembling gear are provided, which enable the stator to be moved clear of the rotor.

MAIN GENERATORS

Each main generator is capable of delivering a maximum of 15,000 kva. at approximately 36.5 cycles. The generators are designed and constructed in accordance with standard land practice, except that the rotor is of the totally enclosed type.

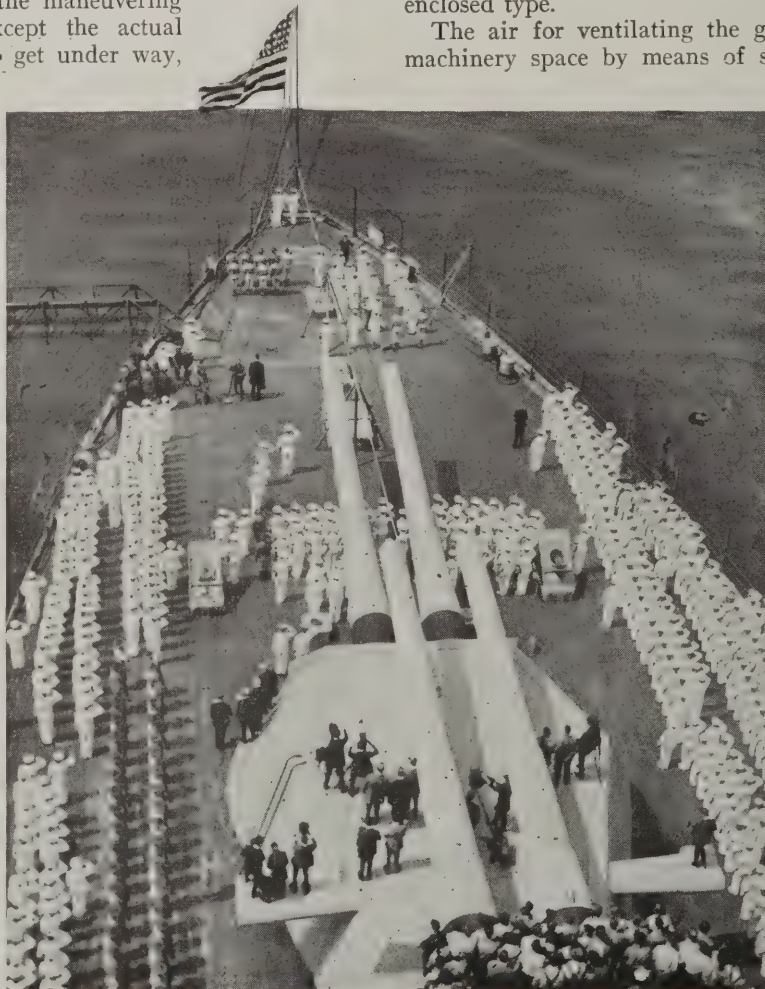
The air for ventilating the generators is supplied to the machinery space by means of separate ventilating blowers.

The air thus supplied is drawn from the lower machinery space through an inlet at the bottom of the generator, through the end bells, entering the machine at each end of the rotor, and is discharged through an outlet duct to the deck.

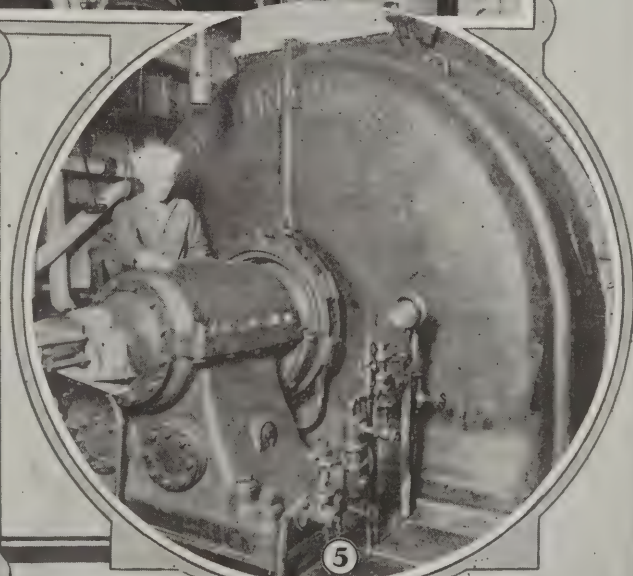
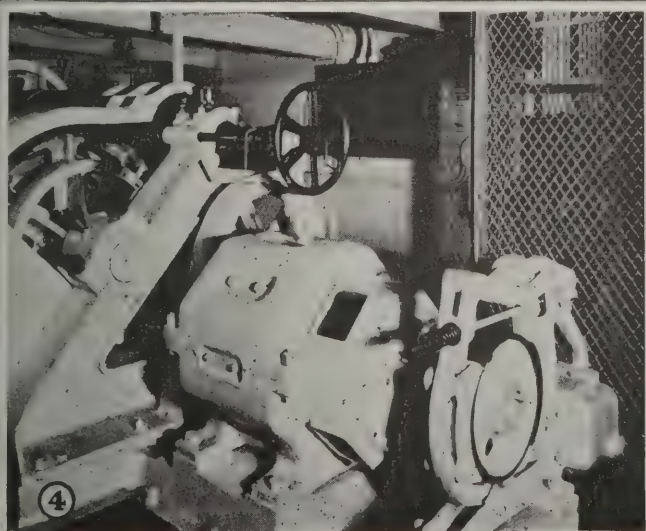
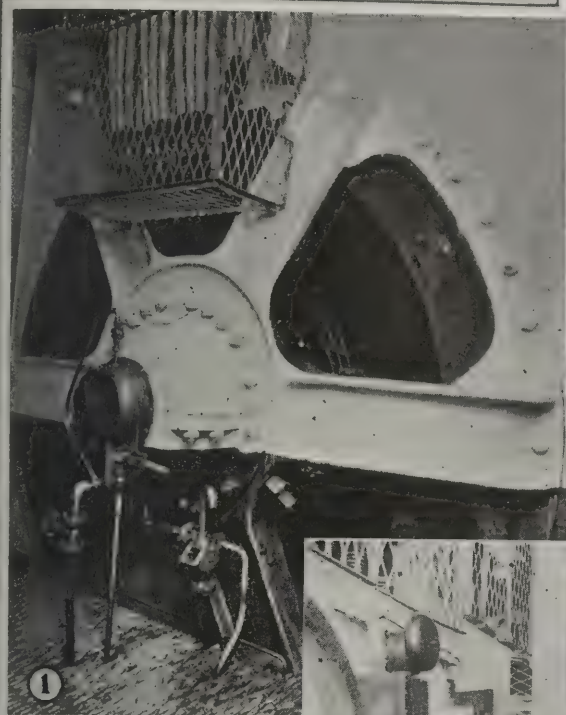
The rotor consists of a solid steel forging having radial slots for receiving the windings. The winding consists of a series of turns of bare copper strap and the insulation is entirely mica and asbestos. After winding, the coils are very substantially braced, in order to prevent any possible movement.

The propelling motors and generators are provided with thermocouples for measuring the hot spot temperatures. These thermocouples are connected to a central potentiometer board in the control room where the readings may be recorded.

To prevent the motors



Hoisting the Flag for the First Time on the New Battleship Colorado



S. S. Colorado: (1) One of the 8,000 Horsepower Propeller Motors; (2) Switchboard in the Engine Room; (3) Control Room, Where a Crew of Six Men Ordinarily Handle the Vessel; (4) Motor Driving One of the Ship's Cranes; (5) One of the 18,000 Horsepower Turbo-Generators

and generators from sweating when idle, heaters are provided, the motors being heated electrically, and the generators by means of steam coils.

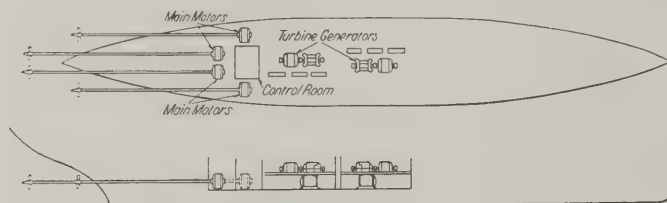
TURBINES

The turbine is of the combined impulse and reaction, semi-double-flow type, allowing complete expansion of the steam in one cylinder. An exhaust connection is provided at each end of the turbine, from whence the steam is conducted to a single condenser.

The turbine speed is regulated by the governor valve only, hand valves being used merely to obtain the best economy, and to prevent overloading the boilers at various standard speeds.

SPEED CONTROL

Briefly, the speed control system consists of a governor driven directly from the turbine shaft through suitable gearing. The governor is essentially a dead weight governor, in



Sketch Showing Location of Propelling Machinery

which the dead weight is replaced by a hydraulic piston, resulting in a type of governor capable of functioning over a wide range of speed by varying the hydraulic pressure on the piston. The speed is adjusted hydraulically by means of a motor operated control valve in the engine room, which regulates the oil pressure. The control for the motor which operates the valve is located in the control room, and hence enables the speed of the turbine to be adjusted electrically from the control room. The position of the speed control element is transmitted electrically to an indicator in the control room, thus enabling the operator at all times to know the position of the turbine speed control system. A double seated poppet valve located on the main steam inlet to the turbine is controlled through a floating lever oil pressure relay system from the main governor, and this valve controls the amount of steam as required to maintain the speed for which the system is set. The governor control valve is also operated through a suitable oil pressure relay by a separate over-speed governor secured to the end of the turbine shaft. In addition, this over-speed governor also operates the main throttle valve in case of necessity.

In order to limit the power input to the turbine on overload conditions to an amount which will prevent excessive overloads on the machinery, and also prevent priming of the boilers, a power limit stop is provided. This is arranged to limit the travel of the governor linkage in the direction which admits more steam. The position of the stop is adjusted electrically from the control room through a system of gearing operated by a small motor. In order that the operator may know when the governor control system is approaching the setting of the power limit stop, an arrangement of pilot lights is provided. The switches for these lights are arranged on the governor linkage that a white light indicates the position for which the stops should be adjusted; a white and red light indicates when the governor is approaching the limit of the stop; and a red light indicates when the stop has been engaged by the governor linkage.

In operation, this system functions as follows: The speed of the ship is set from the control room for any given standard by means of the hydraulic speed-control system. The power limit stop is then adjusted to limit the motor speed to a few revolutions above that corresponding to the standard speed. Should an overload occur from turning or from any other cause, the speed-control governor will tend to maintain a constant speed by admitting more steam. However, as the governor linkage has only an additional limit of travel corresponding to the few revolutions increase in motor speed, the steam which can be admitted to the turbine is, therefore, limited, and consequently the overload has a fixed value for any given condition.

By providing the motors with two sets of windings, more economical operation can be obtained at low speed than would be the case with a single winding motor. For a given motor connection, the propeller speed is varied in the same manner as in the case of a geared turbine drive, that is, by throttling the turbine. The double winding on the motor permits the turbine to be operated at relatively high average speeds for cruising and full speed conditions. This arrangement, together with the arrangements for carrying the load of all four screws on a single generator at reduced power results in fairly flat steam consumption rates for all operating conditions.

MAIN CONTROL

As in the case of any other drive, the control for the electric drive is operated under orders from the bridge. All controlling apparatus necessary for the operation of the propelling machine is either located in the control room, or arranged for remote operation from the control room, except the actual starting of the turbines when preparing to get under way. The main circuits are handled by means of manually operated oil circuit breakers. All circuit breakers

(Continued on page 620)



The Second Colorado was a 22-Knot Armored Cruiser of 13,680 Tons Displacement

Why Americans Pay Greater Panama Canal Tolls

Shipowners, Captains of Vessels and Naval Architects Have
Not Learned to Take Full Advantage of Our Tonnage Laws

By M. C. Davis*

THE statement has often been made that an American ship pays more tolls to transit the Panama Canal than a British or foreign ship of the same deadweight tonnage. This statement unfortunately is true, and the purpose of this article is to explain the reason for it, and also to suggest a remedy.

At the time of the construction of the canal, Professor Emery R. Johnson was directed to compile a set of rules of measurement which would be impartial to all vessels, with a view of using them for the assessing of tolls for this canal. It might be said here that these rules are the fairest and most impartial ever compiled with regard to measurement of vessels. They are called "The Measurement of Vessels for the Panama Canal."

The President's Proclamation of November 13, 1912, stated that merchant vessels carrying passengers or cargo would be charged \$1.20 per net vessel ton, each consisting of 100 cubic feet to the ton.

The Act of Congress of August 24, 1912, provided that tolls may be based upon the gross or net registered tonnage, but based upon the net registered tonnage for ships of commerce the toll shall not exceed \$1.25 per net registered ton.

MUST BE MEASURED IN ACCORDANCE WITH RULES

This matter was referred to the Attorney General who ruled that the \$1.25 net ton meant: \$1.25 times the U. S. net registered tonnage for American vessels and its equivalent for foreign vessels. The result of this is that a vessel is charged \$1.20 times her Panama Canal net tonnage (as derived by the rules called "The Measurement of Vessels for the Panama Canal") provided this amount does not exceed \$1.25 times the vessel's U. S. net registered tonnage or its equivalent in the case of foreign vessels as found on board the vessel at the time that she makes application for transit through the canal. This does not mean that the vessel's tolls will not exceed \$1.25 times her U. S. net register, unless the different spaces in the vessel are in strict accordance with the U. S. rules for measurement of vessels and the latest rules, decisions and interpretations of the Commissioner of Navigation. A vessel whose American register shows her net tonnage to be 5,000 tons, may be charged as high as 5,500 tons for her transit through the canal, this difference being due to the fact that the captain is not familiar with the rules. For instance he might have had hinges placed on the hull opening plates or inserted gaskets therein, thereby disqualifying the entire space from exemption and at the same time decreasing the propelling power allowance by several hundred tons.

As has been previously stated, the rules called "Measurement of Vessels for the Panama Canal" in themselves are fair and impartial and they need no further comment in this article. The U. S. rules of measurement for vessels, however, have a large number of loop holes whereby the net tonnage on the register may be decreased by conforming to certain technicalities of these rules. As the tolls for a vessel transitting the canal cannot exceed \$1.25 times this net register, it is apparent that the lower the net tonnage shown in this register is, provided said spaces are in accordance with the rules, the less tolls the vessel pays in transitting the canal. These rules provide that if certain spaces on board a

ship have certain means of closing, which, technically are not watertight, the entire space shall be exempt from the gross and net tonnage of the vessel. In this respect the rules are practically an exact copy of the British rules, with the exception of the exemption on passenger vessels of cabins or staterooms situated on or above the first deck, which is not a deck to the hull. In this the American rules go the British one better in the exemption of all cabins and staterooms situated in these spaces.

SPACES THAT CAN BE EXEMPTED ON CARGO VESSELS

The spaces that can be exempted on cargo vessels when properly fitted with tonnage openings are: The forecastle, bridge and poop when said spaces are fitted to carry cargo in this type of vessel; and the entire shelter deck where fitted to carry cargo in the case of shelter deck vessels.

BRIDGE SPACE

This space, when added to the register is the largest one which can be exempted in the "three island" type of vessel. This usually runs from 300 to 600 tons. When this space is included in the register, the vessel usually obtains what is called the 175 percent propelling power deduction which means the actual space of the engine room and fireroom including shaft-alleys and escapes, and a portion of the space above the fireroom and engine room when properly certified and authority obtained from the Commissioner of Navigation for adding same and 75 percent of this total space in addition for bunkers. This deduction is from 200 to 800 tons less than the 32 percent propelling power deduction, which means 32 percent of the gross tonnage of the vessel. The application of this deduction will be taken up later in this article. However, it can readily be seen that when a vessel has the bridge space included and the 175 percent propelling power deduction, it would be of great advantage to the ship to have the tonnage openings installed, thereby exempting the entire space and also obtaining the more advantageous propelling deduction, namely, 32 percent of the gross tonnage.

DOES NOT BAR CARRIAGE OF CARGO

It must be understood that when tonnage openings are fitted to these spaces, they do not bar the carrying of any kind of cargo in this space as they are for the express purpose of making these spaces technically comply with the law regarding them. The question might readily be asked here: Why do they not change such a law? The answer is: That England and other foreign countries, many years ago adopted this method in order to encourage their merchant marine thereby reducing the harbor dues, lighthouse, wharfage and other dues in foreign countries where they are based on the gross or net tonnage of the vessel. The only thing left for the United States to do out of self-protection was to adopt similar rules for its vessels.

The writer has reduced the tonnage on some vessels of this type as high as 1,200 tons by simply having these tonnage openings installed, thereby saving the operators \$1,600 on each and every transit through the canal; and the difference due to the reduction of this tonnage in harbor dues, dry docking and so forth in all cases where the charges are based on the gross or net registered tonnage.

* Formerly chief admeasurer, Pacific entrance to Panama Canal.

The entire space in the bridge can be exempted with the exception of any space within it which is entirely closed in, such as a storeroom or refrigerator room. Machine shops and refrigerating machinery located in this space are exempted under the rule which exempts all machinery above the tonnage deck. In order to have this space exempted, it is necessary to install two tonnage openings in the after end of the bridge either in the bulkhead or in the two after-doors when they are large enough to permit the installation of openings of the size required by law. These requirements are that this opening must be not less than 3 feet wide and 4 feet high and that the bottom of the opening must not exceed 24 inches from the deck. It might here be stated that the American Bureau rule required that this opening must be at least 18 inches from the deck so this leaves a lee-way of 6 inches in which to lay off the bottom of the opening.

This opening can be closed by a steel plate preferably of



Fig. 1.—Method of Obtaining Exemption and at Same Time Retaining Access by Door in Tonnage Opening

the same thickness or thicker than the bulkhead or door where it is cut out. Angle-iron stiffeners must be installed on the inside edge of the opening with the toe of the angle placed next to the opening. The plate must be held in place by hook bolts, the hook of which grasps this angle-iron. The hole for these bolts must only be through the plate and not in the bulkhead and must be spaced not less than 12 inches apart, measuring across the shortest distance from center to center. One of the most serious mistakes that have been made in this connection has been the spacing of these bolts $11\frac{3}{4}$ or $11\frac{7}{8}$ inches apart. *One bolt thus spaced disqualifies the entire space from exemption*, due to the fact that the rule says that the opening must be at least 3 feet by 4 feet and that it is impossible to get four bolts across the top spaced 12 inches apart. It is, therefore, advisable to make the

COMPARISON OF TONNAGE BEFORE AND AFTER INSTALLING TONNAGE OPENINGS IN BRIDGE SPACE OF S. S. JOHN ADAMS.

	Before.	After.
Underdeck tonnage	7,203.09	7,203.09
Forecastle	112.56	112.56
Bridge	567.50	91.20
Poop	69.76	69.76
Round houses	186.51	186.51
Chart houses	7.17	7.17
Radio houses	4.73	4.73
Excess hatchways	48.20	50.58
Light and air	89.69	84.13
Gross tonnage	8,289.21	7,809.73
Deductions.		
Crew's space	237.37	237.37
Master's cabin	26.50	26.50
Anchor gear	16.40	16.40
Boatswain's stores	49.17	49.17
Chart house	7.17	7.17
Radio house	4.73	4.73
Propelling power (actual space)		
175%	1,800.01	32%* 2,499.11
	2,141.35	2,840.45
Gross	8,289.21	7,809.73
Deduction	2,141.35	2,840.45
Net tonnage	6,147.86	4,969.28
	4,969.28	
Net saving in tonnage	1,178.58	

*By this alteration the engine room space was made to exceed 13 percent of the new gross tonnage, thereby allowing the vessel the 32 percent propelling power deduction.

opening 38 inches by 50 inches, thereby gaining 2 inches to allow for the thickness of the bolts.

GASKETS CANNOT BE USED

Extreme care should be exercised in cutting the openings of the plate and the fitting of the angle-iron in order to see that they are as true as possible. Under no condition can gaskets of any nature be used. Not even a red lead and putty gasket can be used in making up this joint. There is, however, no objection to a coat of red lead being applied as a preservative of the metal. Under no condition is this plate to be fitted with hinges as it then becomes a permanent means of closing and is immediately disqualified as a tonnage opening.

In the event that there is a center line bulkhead or partition within this space, a similar opening must be installed or one in which two channel irons are fitted at the sides of the opening and closed with suitable shifting boards. If desired this method can be used instead of the steel plates in the after bulkheads. This method is almost universally used for tonnage openings in British vessels. However, *the fitting of both methods in the same space has recently been ruled by the Commissioner of Navigation as sufficient reason to disqualify this space from exemption.*

When the watertight doors on the after end of this space are of sufficient size, the steel plates may be fitted in same as shown in Fig. 2. This method has been approved by the Commissioner of Navigation and qualifies the space for exemption. At the same time it furnishes a ready means of access to the exempted space. In the event that it is impossible to fit two of these openings in the after end, one opening may be fitted in the center of the bulkhead or on the side, provided there are two freeing ports on each side at least 18 by 18 inches and a suitable number of scuppers, three on each side being considered a suitable number, draining from the above-mentioned space. When the space is so fitted, it will be entitled to exemption.

It will be noticed that no mention has been made for tonnage openings on the forward end of the bridge space for

the reason that the rules only require two openings to qualify the space for exemption. It is difficult to make openings in the forward bulkhead tight enough to prevent water getting in, as it is exposed to the more severe action of the sea in rough weather.

FORECASTLE

In order to exempt a portion of this space, it is necessary that it have a large space suitable for cargo and not occupied by quarters, lamp room, boatswain's stores and so forth. As a rule this space is not sufficient to warrant an installation of tonnage openings except in the case where the bridge space and possibly the poop have been exempted, and there is not sufficient space in the engine room, fireroom and space above these which is called, "light and air," to qualify the vessel for the 32 percent propelling power deduction. If it is necessary to exempt this space, it can be done by installing the same type of tonnage openings described above and in accordance with the instructions for installation of the same in the bridge space. In case, however, that only one opening is fitted, either in the center or on the side, it only requires scuppers and not freeing ports.

POOP

This space, like the bridge and forecastle, may be exempted, if the cargo space is large enough to warrant the installation of tonnage openings, in which case openings as described above for the bridge may be installed as required. The same exception applies where one opening is fitted as is specified above for the forecastle.

The classification society, however, requires that the open-



Fig. 2.—Method of Obtaining Exemption and at Same Time Retaining Access by Tonnage Opening in Door

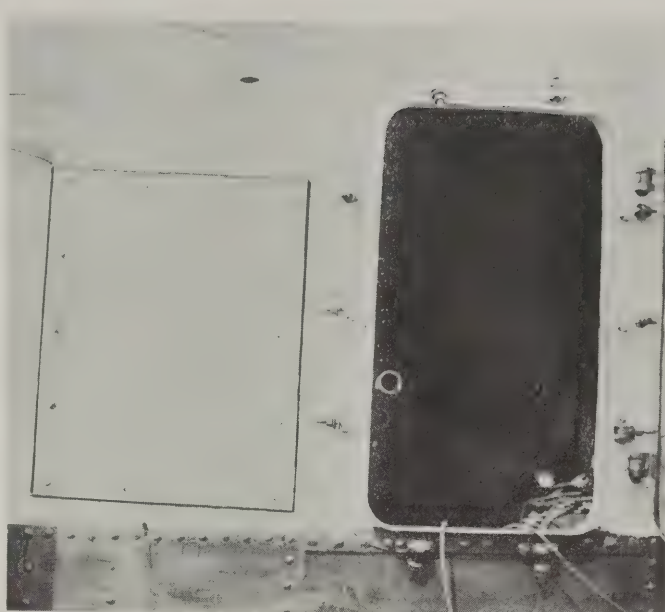


Fig. 3.—Method of Obtaining Exemption and at Same Time Retaining Access by Door at Side of Tonnage Opening

ings in this space be fitted with shifting boards and channel irons.

SHELTER DECKS

In the case of shelter deck vessels, the entire cargo space in the shelter deck may be exempted from the gross and net tonnage amounting to from 1,000 to 1,800 tons, according to the size of the vessel, by having what is commonly known as a tonnage hatch installed at a suitable point, either at the forward or after end of the deck. If situated aft, the distance from the after edge of this tonnage hatch and the after side of the stern post must not be less than one-twentieth the registered length of the vessel; if the opening is placed forward, the forward side of hatch must not be less than one-fifth the length of the vessel from the stem.

This tonnage hatch must be not less than 4 feet long and the width must be at least equal to that of the after cargo hatch on the same deck. The coaming in this hatch must not exceed 12 inches mean height above the deck and must be fenced in with guard rails and stanchions, the latter being so fitted as not to lend themselves to battening down the opening. If portable wooden covers are fitted, the lashings, if any, beneath, for holding them down are to be of hemp. All openings in the upper deck are to be provided with the proper means for closing and battening down, but the installation of cleats in this connection disqualifies this entire space from exemption. In addition to this, there must be a freeing port of suitable size (at least 18 inches square or larger) on each side and abreast the deck opening and the bottom of these openings must not be over 12 inches from the deck. A suitable number (at least three on each side) of scuppers, not less than $3\frac{1}{2}$ inches in diameter distributed throughout the shelter deck space must also be fitted.

When this hatch is situated aft, there must be at least two openings in all transverse bulkheads in the 'tween decks forward of the tonnage hatch to entitle the space to exemption. These openings must comply as regards dimensions, and height of coamings, if any, with the requirements as given for the openings to qualify the bridge space for exemption. The openings in the forward bulkhead of the well under the tonnage hatch and in all transverse bulkheads must be closed with the channel bars at the side of the opening fitted with shifting boards as described above. *The steel plates as described for the bridge space will not qualify this space for exemption.*

PASSENGER ACCOMMODATIONS

In accordance with the instructions for the measurement of vessels, no part of any vessel will be measured for tonnage that is used for cabins or staterooms constructed entirely above the first deck which is not a deck to the hull. In this case, however, these cabins and staterooms in order to enjoy this exemption must be set aside exclusively for the passengers, as any space occupied by officers or other members of the crew, wherever situated, must be included in the gross tonnage and deducted from the net when so entitled.

PROPELLING POWER DEDUCTION

There are two methods of arriving at this deduction according to the actual size of the engine room and fireroom, and that portion of the space commonly known as "light and air," which is the space above the crown of the engine and fireroom when used for the admitting of light and air to these spaces. When the total engine room and fireroom space is less than 13 percent of the gross tonnage of the vessel, 175 percent (that is the actual space plus 75 percent of the same) is allowed as the propelling power deduction, the 75 percent being allowed for the bunker space. When the total of these spaces exceed 13 percent of the gross tonnage, 32 percent of the gross tonnage is allowed as the propelling power deduction.

In this connection, in cases where actual engine room and fireroom space is less than the 13 percent, but can be made to exceed the 13 percent by adding a portion or all of the light and air space; it is necessary to submit a written request from the owners to the Commissioner of Navigation that this space be so allowed. This request must be accompanied with a description and sketch or tracing, giving the measurements thereof and the certification by the collector of port that such space or spaces are reasonable in size and are for the sole purpose of machinery or for the admittance of light and air to the machinery. When this authority is obtained this space must be added to the gross tonnage in order that same may be allowed as machinery space.

In the case of oil burning vessels having bonafide settling tanks situated outside the confines of the engine room or fireroom, they may also be added to the engine room space by obtaining authority from the Commissioner of Navigation in the same manner as required for light and air.

It will be readily seen that in the case of a vessel whose actual engine room and fireroom amounts to about 11 percent of the gross tonnage of the vessel, it is very beneficial for the owners to make application for sufficient light and air to be added to bring the engine room up to 13 percent, thereby securing the 32 percent deduction and reducing the net tonnage from 300 to 700 tons according to the size of the vessel.

The 32 percent deduction is approximately equivalent to an engine room of from 19 to 20 percent of the gross tonnage of the vessel. For this reason, if the engine room and fireroom combined exceed 20 percent of the gross tonnage and it is requested by the owners, the 175 percent rule which is more advantageous than the 32 percent in this case may be used.

MEASUREMENT OF ENGINE ROOM

In referring to the engine room, it is understood to be that space occupied by the engine room itself and boiler room together with the spaces strictly required for the workings of the engines and boilers, the space below the crown of the engine room. In this connection the crown or top of the main space of the actual engine room from which the depth of same is to be taken will either be at the under side of a deck or if the side bulkheads are curved, at the point or height at which the curve terminates; and the contents of the shaft alley, alleys or trunks in screw vessels including the escape trunk leading from the after part of the shaft alley to the deck, provided that it is not larger than necessary for the

purpose of an escape from the shaft alley to the topsides.

The length of the engine room extends from the bulkhead just forward of the fireroom to the one aft of the engines, provided that space is not in excess of that required for the actual operation of the engines and boilers. In case this exceeds the space required, only the space actually required for this operation is allowed. In addition to this, engineer storerooms, tool rooms and dynamo plants, when situated in the engine room and not partitioned off by watertight partitions are included in the engine room space. It is, therefore, advisable to partition these parts off with plates half-way up, the remaining distance being enclosed with heavy wire screening.

ADVANTAGE ENJOYED BY OIL BURNERS

Due to a recent decision of the Commissioner of Navigation in which he directed that all double bottoms of the cellular type be exempted from measurement: It has given the oil burning vessel considerable advantage over the coal burning ones, due to the fact that they can carry their fuel in their double bottoms which are not included in the gross tonnage. They also have their settling tanks included as a portion of the engine room, thereby, when necessary, increasing this space just sufficiently to slightly exceed the 13 percent of the gross tonnage, and so obtain an exemption of 19 percent of their cargo space, whereas in reality their bunker space is in their double bottoms which is not included in their tonnage.

The rules of measurement require that all spaces which are deductible must have, permanently cut in a beam and over the doorway of every such space the number of men it is allowed to accommodate or the purpose for which used, the following words: "Certified to accommodate — seamen," "certified messroom," "certified W. C.," etc.

It will be noted from the above that the words gross and net tonnage of a vessel have absolutely no meaning in connection with the size of the vessel, or the amount of cargo she can carry, but are merely a combination of figures which indicate the amount of attention that the owners pay to the exemptions in the law which has been enacted for their benefit.

When the statement was made at the beginning of this article, that an American ship pays more to transit our own American canal than a foreign vessel of the same size, it will be seen that this is due to the fact that the foreign shipbuilders and operators pay particular attention to the different parts of their vessel and that they obtain all exemptions and advantageous deductions, while the American ships do not, due to the fact that these spaces are not fitted in accordance with the rules. The result is that they throw up their hands as a certain very prominent steamship man did, and cried to Congress to change the laws in order to save the American merchant marine, whereas Congress has done everything in its power to help the ships. The only thing to do is for the steamship owners to familiarize themselves with the law and fit their ships accordingly to derive the benefits of existing laws and rulings.

Unfortunately it has been noted how little the American master knows of the tonnage rules in comparison with the masters of foreign vessels.

From the experiences related by various admeasurers in the prosecution of their duties, it would seem that in order to meet all degrees of competition, all parties, owners, masters of vessels and naval architects should familiarize themselves with the canal rules and incorporate the necessary changes in the vessel's hull, not with the purpose of evasion, but with the purpose of taking full advantage of the laws that are designed to benefit our merchant marine by wise exemptions. The foregoing paragraphs indicate in a measure how this can be done and it is hoped that some steamship companies will benefit by it accordingly.



S. S. Minnewaska—the First of the New Atlantic Transport “Minne” Boats

New Atlantic Transport Passenger Liner Minnewaska

**First of the New “Minne” Steamers Renews Direct
Passenger Service Between New York and London**

THE new Atlantic Transport liner *Minnewaska*, which recently completed her maiden voyage from London to New York, is a fine example of post-war shipbuilding. Designed and constructed at the yard of Harlan & Wolff, Ltd., at Belfast, Ireland, she is the largest vessel launched at that famous shipbuilding center since the war and is the largest vessel plying to the port of London. She will be followed early next year by a sister ship, the *Minnetonka*.

ORIGINAL “MINNE” SHIPS

Since losing its four original “Minne” boats in the war—all were sent down by mines or torpedoes while serving as transports—the Atlantic Transport Line has maintained a large and regular service for freight between American and British ports. The original “Minne” ships were vessels of about 14,000 tons register. The new ships are some 7,000 tons larger than the old and as a matter of course more elaborately fitted.

CARRIES FIRST-CLASS PASSENGERS ONLY

Great care was exercised in designing and building a ship that should meet every established requirement of the Atlantic Transport Line—large cargo capacity combined with high-class accommodation for first-cabin passengers only being chief essentials.

Following traditional practice, proven sound in the earlier ships of the “Minne” class, generous breadth was decided on, to give steadiness at sea. The design called for a big-bodied ship, therefore, having nothing of the express type about her, yet capable of good speed.

GREAT BEAM INSURES STEADINESS

In order to secure great steadiness at sea, the new liner has been given a greater breadth in proportion to her length than any other liner—80.37 feet to an overall length of 626 feet. Having a cargo capacity of 17,000 tons, and being fitted with bilge keels, the *Minnewaska* with her generous beam is one of the steadiest ships afloat.

Another outstanding feature of the new ship is the amount of space available to each passenger, which exceeds that on any other ship, owing to the fact that the passenger list is restricted to 369 persons, while the cubic contents of passenger accommodation, and the area of the ship’s decks, are on a scale that would afford generous space to a much greater number.

The following are the main particulars of the vessel:

Length overall	626	feet
Length between perpendiculars	600.8	feet
Beam, molded	80.37	feet
Depth	49.4	feet
Gross Tonnage	21,400	
Deadweight tonnage	17,000	
Horsepower	15,000	
Designed speed	17	knots
Trial speed	17.8	knots
Number of first class passengers	369	

PASSENGER ACCOMMODATIONS

All passenger quarters are amidship, and above the upper deck D. There are four decks devoted exclusively to passenger accommodations.

One deck, A, is given over entirely to public rooms which are of generous size and reflect an atmosphere of dignity. Fine natural wood panelings and white walls are the keynote of the principal decorations. The lounge is finished in American sycamore, in seventeenth century style; the reading-room in white; the smoking-room in paneled cedar; entrance halls in oak; the dining saloon—seating 322 persons at small tables—and the adjoining reception room in white and oak. In the reception room is a concert organ, a grand piano and a parquet floor for dancing.

Staterooms are designed to give large space to each passenger. Each principal stateroom has a bedstead, and some two, of either mahogany or oak.

B deck is occupied principally by suites and the larger staterooms. There are two suites here consisting of sitting-room, bedroom and bath, and ten semi-suites, consisting of



Promenade Deck

bedroom with bath, besides various connecting bedrooms. There are thirty-nine baths altogether, and all bedrooms have running hot and cold fresh water, steam heat, and direct and indirect ventilation. All B deck rooms have rectangular windows, as in a house.

The service section of the ship is designed to embody many modern features, including a complete electrical bakery, and electric kitchen equipment.

PROPELLING MACHINERY

Propulsion is by a two-shaft arrangement of Brown-Curtis single reduction geared turbines with an astern tur-



Reading Room

bine incorporated in the exhaust casing of each low-pressure turbine.

Steam is generated at 215 pounds per square inch and with a superheat of 100 degrees F. in 12 watertube boilers, which are arranged for oil burning under the White low pressure system, working under assisted natural draft.

AUXILIARIES ELECTRICALLY DRIVEN

The electrical installation is very extensive. All winches are electrically driven as are nearly all the engine room auxiliaries. There are four 400 kilowatt direct current generators, each coupled direct to a steam turbine. The dynamos run in parallel and are each capable of giving an output of 1,818 amperes at 220 volts. In addition there is one 75 kilowatt dynamo direct coupled to a Burmeister & Wain Diesel oil engine, situated at the stern for supplying current if for any reason the main dynamos are out of action.

The electrically driven engine room auxiliaries include the main circulating pumps, of which there are four, each of 120 brake horsepower, sanitary pump, forced lubricating pumps, air and circulating pumps for the auxiliary condenser, forced draft fans and bilge pumps. In all, 20 electrically driven ventilating fans are fitted.



Deck View Aft, Showing Cargo Handling Appliances



Lounge

Oil-Fired Scotch Boiler Gives 85 Percent Efficiency*

By C. J. Jefferson**

Tests by United States Shipping Board and Bureau of Mines show that combined efficiencies of Scotch boiler, superheater and air heater of 85 percent can be obtained with oil-firing and forced draft, 83 percent with oil-firing and induced draft and 78 percent with hand-firing, coal-burning and forced draft.

THE following brief account of the tests run on a Scotch marine boiler by the United States Shipping Board in conjunction with the Bureau of Mines has been written with the idea of presenting to the marine world a few facts and figures in regard to the possible efficiencies and capacities that may be obtained with the Scotch marine boiler, provided

The first essential in obtaining higher efficiencies is to educate the operating personnel to the point where they appreciate what higher efficiencies mean, how to use the instruments necessary for determining the efficiency of combustion, and how to correct faulty combustion and thereby build up boiler efficiency.

For this purpose the United States Navy has now opened a school at the Philadelphia Navy Yard for the benefit of the United States merchant marine, where a short and intensive course is given in the theory and practice of fuel-oil burning. Candidates for this school must be American citizens holding merchant marine licenses with the grade of second assistant or higher.

The tests which are outlined below were conducted by the United States Shipping Board in order that reliable and accurate data might be obtained as to the possible efficiency and capacity of the Scotch marine boiler, which is one of the oldest types of boilers in service and which has been accepted as a good, reliable servant without due regard being paid to its possible efficiency.

The Bureau of Mines was especially interested in making the thermodynamic survey of the boiler by means of thermocouple readings, gas analyses, etc., to determine the effects of combustion by the water-cooled furnace.

it is operated with the same care in supervision as that given to the average efficient stationary plant.

From the analysis of the logs of approximately 250 vessels, it is apparent that the average merchant marine cargo carrier develops approximately 60 to 65 percent efficiency in her boiler plant when oil-fired and that these values are from 55 to 60 percent for coal-fired boilers. This same condition holds true for the average stationary plant of less than 1,000 boiler horsepower, as has been shown by several analyses made at various times of boiler tests conducted on this type of plant.

The time has come, however, when better results must be obtained. The Diesel engine is rapidly entering the marine field and the steam-driven vessel must develop its maximum efficiency, if it hopes to be able to sail in competition with the motorship, even after making all allowances for the relative difference in the first cost for installation.

Moreover, the merchant marine of the United States has established a higher standard of living for its operating personnel than its competitors. This higher standard means increased cost of operation, which, in turn, must be met by increased efficiency of performance.

*Abstract of paper read before Metropolitan Section of the American Society of Mechanical Engineers, New York, November 14, 1922.

**Head of Fuel Conservation Section, United States Shipping Board.

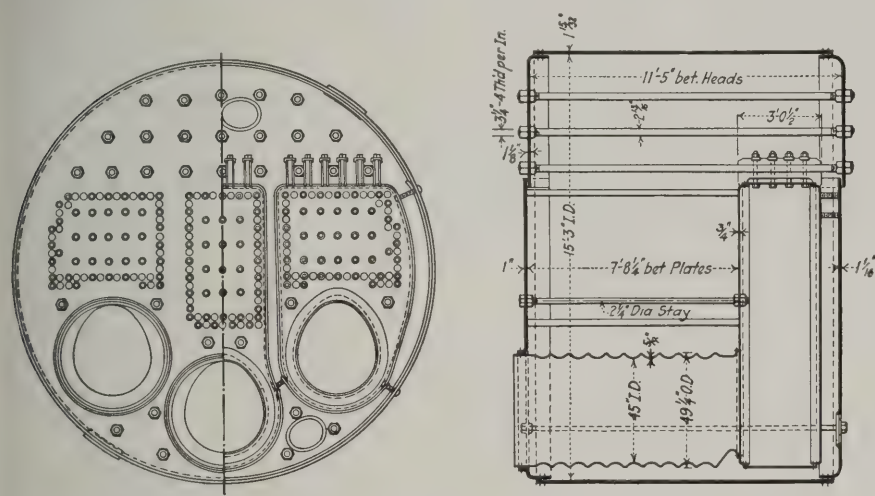


Fig. 1.—General Arrangement of Scotch Marine Boiler Tested

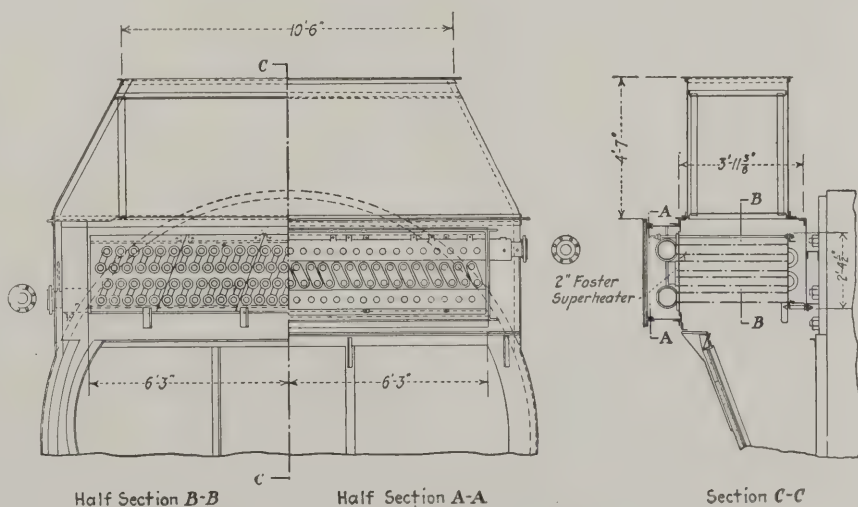


Fig. 2.—Superheater Used with Scotch Marine Boiler Tested

Its findings are now being prepared by Mr. Mumford of the Bureau of Mines and his associates who worked with him and the author in carrying out these tests.

The boiler selected for the test purposes was a single-ended, three-furnace, separate-combustion-chamber type, hav-

ing 2,777 square feet of heating surface with coal fire and 3,022 square feet with oil fire. The boiler was fitted with a Foster waste-heat superheater having 774 square feet of heating surface and which was placed within the gas pass above the smokebox. Above this superheater was an air heater having 1,220 square feet of heating surface which heated the air supply to the Howden fronts when running forced draft. Fig. 1 shows the general arrangement of the boiler and Fig. 2 that of the superheater.

THE TESTS

Tests were divided into four distinct groups, namely, hand-fired coal, pulverized coal, forced-draft oil fire, and induced-draft oil fire. The pulverized-coal experiments were conducted to the point where it was demonstrated that this type of firing is not feasible for marine service of the Scotch boiler, as the limited size and water-cooled feature of the furnaces and combustion chambers prevented operating at ratings which were sufficiently high to meet the demand made by the average marine boiler plant.

Fig. 3 shows the boiler fitted for the hand-fired coal-burning test. In this figure the smokebox, ashpit, and fire doors

are shown wide open as it was taken immediately after thorough cleaning of the fire side of the boiler in preparation for the test. Four of the coal-burning tests which show typical results are given in Table 1. These tests are selected as representing results covering a combustion range from 13.07 pounds to 30.9 pounds of coal per hour per square foot of grate surface. It will be noted that the plant efficiency including boiler, superheater, and air heater ranges from 73.9 to 77.9 percent. All of these tests were run under forced-draft operating conditions.

The forced-draft oil-burning tests were conducted using Dahl, Schutte & Koerting, Coen, Todd, and Bethlehem Shipbuilding Corporation burners, all of these except the last named being used in conjunction with the Howden combined oil- and coal-burning front.

FORCED-DRAFT RUNS

Fig. 4 shows the boiler fitted with burners installed in the Howden front for forced-draft runs. Table 2 gives the results for three representative tests of this series covering a range of from 0.276 to 0.666 pound of oil per hour per square foot of heating surface. It will be noted that the combined boiler, superheater and air heater efficiency ranges from 83.5 to 84.6 percent. Fig. 7 gives the average efficiency values covering the entire series of forced-draft oil-burning tests.

TABLE 1.—HAND-FIRED COAL TESTS OF SCOTCH MARINE BOILER

Boiler: 3-furnace, with separate combustion chambers; heating surface, 2,777 square feet; grate surface, 61.8 square feet; area through tubes, 11.94 square feet; combustion chamber volume, 289.4 cubic feet; heating surface of air heater, 1,220 square feet; superheater heating surface, 774 square feet; retarders in tubes; bridge wall, C.I.V.; Coal used, Georges Creek run of mine.

Test number	1-1-10	1-1-9	1-1-8	1-1-11
Duration, hours	12.0	10.0	8.083	6.089
Total fuel fired, pounds	9,696	12,000	12,521	11,619
Fuel as fired, pounds per square foot of grate surface per hour	13.07	19.4	25.1	30.9
Proximate analysis of fuel:				
Moisture, percent	2.15	2.27	1.97	2.17
Fixed carbon, percent	70.93	69.87	70.00	69.44
Volatile, percent	18.84	19.07	19.52	19.14
Ash, percent	8.08	8.79	8.51	9.25
Heating value, B.t.u. per pound	13,329	13,779	13,858	13,683
Ultimate analysis of fuel:				
Hydrogen, percent	4.61	4.58	4.58	4.56
Carbon, percent	80.08	79.34	79.73	79.01
Nitrogen, percent	1.91	1.81	1.91	1.89
Oxygen, percent	4.43	4.52	4.27	4.42
Sulphur, percent	0.89	0.88	0.95	0.87
Ash and refuse:				
Total weight, pounds	1,200	1,340	1,309	1,125
Percent referred to dry coal	12.66	11.40	10.60	9.90
Heating value, B.t.u. per pound	3,110	4,540	4,120	4,938
Flue-gas analysis:				
CO ₂ , percent	11.2	12.2	12.3	11.8
O ₂ , percent	6.8	6.6	6.4	7.3
CO, percent	0.07	0.2	0.3	0.02
N ₂ , percent	81.88	81.0	81.0	80.88
Boiler pressure, gage, pounds per square inch	163	157	166	158
Superheat, degrees	1	14	23	38
Moisture in steam leaving boiler, percent	0.58	0.50	0.55	0.57
Drafts and air pressures (inches of water):				
Below grates	+ 0.19	+ 0.54	+ 0.605	+ 0.900
Furnace	+ 0.02	+ 0.16	+ 0.283	+ 0.380
Below air heater	+ 0.08	+ 0.058	+ 0.065	+ 0.090
Base of stack	- 0.12	- 0.122	- 0.092	- 0.130
Gas temperatures (degrees F.):				
Leaving boiler	437	503	537	606
Leaving superheater	372	447	472	519
Leaving air heater	277	336	361	396
Total water fed to boiler, pounds	100,560	124,670	122,328	116,988
Feedwater temperature, degrees F.	212	204	193	208
Equivalent evaporated steam from boiler, pounds per hour per square foot of heating surface	3.14	4.71	5.78	7.4
Actual evaporation per pound of coal fired	10.37	10.40	9.76	10.07
Efficiency of boiler without superheater, percent	75.2	76.7	72.6	74.6
Heat balance:				
Heat absorbed by boiler, percent	75.8	77.9	73.9	76.8
Loss due to moisture in fuel, percent	0.2	0.2	0.2	0.2
Loss due to burning hydrogen in fuel, percent	3.4	3.5	3.5	3.6
Loss due to heat carried away in dry gas, percent	6.2	7.1	7.4	9.3
Loss due to CO, percent	0.4	0.9	1.3	0.1
Loss in combustion—ash and refuse, percent	2.5	3.3	2.8	3.1
Loss unaccounted for, percent	11.5	7.1	10.9	6.9
Heat in fuel as fired, percent	100	100	100	100

TABLE 2.—FUEL-OIL TESTS OF SCOTCH MARINE BOILER—HOWDEN FRONT FORCED DRAFT

Boiler: 3-furnace, with separate combustion chambers; heating surface, 3,022.4 square feet; heating surface of air heater, 1,220 square feet; superheater heating surface, 774 square feet; retarders in tubes.

Test number	26	36	43
Duration, hours	8.03	2.888	3.026
Combustion space, cubic feet	561	545	588
Total fuel fired, pounds	6,704	3,794	6,091
Fuel per burner per hour, pounds	278	438	671
Fuel per hour per square foot of heating surface, pound	0.276	0.435	0.666
Analysis of oil as fired:			
Moisture, percent	0.9	0.3	0.3
Sediment, percent	trace	trace	trace
Hydrogen, percent	11.9	11.72	11.6
Carbon, percent	83.3	83.83	84.5
Sulphur, percent	3.9	4.15	3.6
Gravity, degrees B.	15.4	15.4	15.4
Specific gravity	0.963	0.963	0.963
Flash point, degrees F.	166	166	166
Burning point, degrees F.	234	234	234
Heating value, B.t.u. per pound	18,193	18,324	18,234
Flue-gas analysis:			
CO ₂ , percent	10.8	12.3	12.6
O ₂ , percent	6.3	4.5	3.7
CO, percent	0.03	0	0
N ₂ , percent	82.87	83.2	83.7
Weight of gas per pound of fuel, pounds	19.37	16.9	16.83
Boiler pressure, gage, pounds per square inch	170	172	178
Superheat, degrees	24	32	45
Moisture in steam leaving boiler, percent	0.65	0.62	0.62
Drafts and air pressures (inches of water):			
Furnace	+ 0.29	+ 0.19	+ 1.28
Below superheater	+ 0.08	+ 0.09	+ 0.05
Below air heater	+ 0.11	+ 0.11	+ 0.09
Base of stack	- 0.14	- 0.14	- 0.11
Gas temperatures (degrees F.):			
Leaving boiler	533	597	665
Leaving superheater	470	512	571
Leaving air heater	341	385	428
Total water fed to boiler, pounds	97,635	56,574	88,130
Feedwater temperature, degrees F.	188	218	206
Equivalent evaporated steam from boiler, pounds per hour per square foot of heating surface	4.29	6.72	10.10
Actual evaporation, pounds per pound of oil fired	14.57	14.91	14.47
Efficiency of boiler without superheater, percent	82.80	81.80	80.73
Heat balance:			
Heat absorbed by boiler and superheater, percent	84.6	83.8	83.5
Loss due to moisture in fuel, percent	0	0	0
Loss due to burning hydrogen in fuel, percent	6.0	5.6	6.0
Loss due to heat carried away in dry gas, percent	3.8	3.9	4.4
Loss due to CO, percent	0.2	0	0
Loss in unconsumed oil and unaccounted for, percent	5.4	6.7	6.1
Heat in fuel as fired, percent	100	100	100

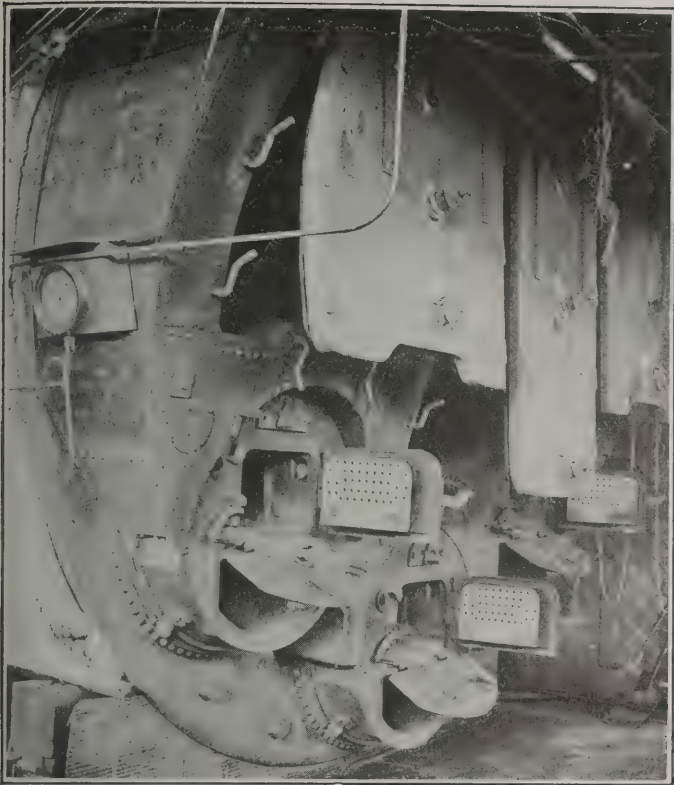


Fig. 3.—Scotch Marine Boiler as Fitted for Hand-Fired Coal-Burning Test

The induced-draft tests were conducted with the Bethlehem Shipbuilding Corporation burner shown in Fig. 5, as well as with the Schutte & Koerting types "L" (modified) and "N," the Coen, the Todd, and the Enco burners. This latter burner, Fig. 6, was originated at the Philadelphia Navy Yard Fuel Oil Test Plant, and its adaptation for use in Scotch boiler service was developed during these tests.

INDUCED-DRAFT TESTS

The ratings obtained in these induced-draft tests were limited by the amount of available draft as the height of stack above the center of furnace was only 40 feet and this draft was augmented by a 1/2-inch steam nozzle. The combined effect of the stack and nozzle produced an 0.9-inch draft at the base of the stack. Table 3 gives the data of four representative tests covering a range of from 0.233 to

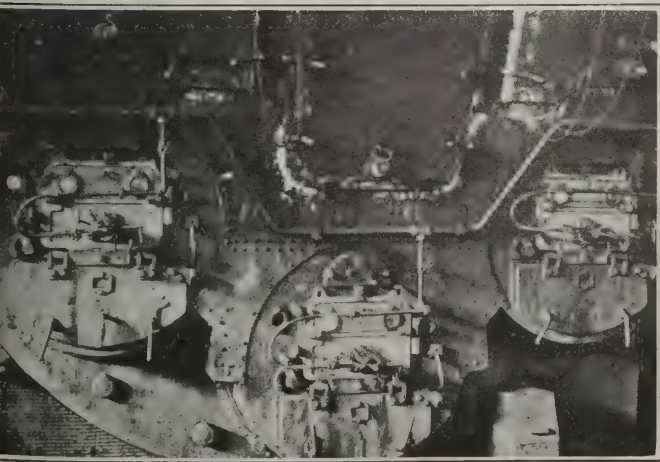


Fig. 4.—Scotch Marine Boiler as Fitted with Burners Installed in Howden Front for Forced-Draft Runs

TABLE 3.—FUEL-OIL TESTS OF SCOTCH MARINE BOILER—NATURAL DRAFT REGISTERS

(Boiler same as used in tests of Table 2)

Test number	97	94	67	79
Duration, hours	3.00	2.498	3.203	2.981
Combustion space, cubic feet	560	560	561	564
Total fuel fired, pounds.....	2,111	2,868	4,408	4,625
Fuel per burner per hour, pounds...	235	383	459	517
Fuel per hour per square foot of heating surface, pound	0.233	0.380	0.455	0.513
Analysis of oil as fired:				
Moisture, percent	0	0.1	0.1	0
Sediment, percent	trace	trace	trace	trace
Hydrogen, percent	11.37	11.25	11.34	11.78
Carbon, percent	84.08	83.82	83.60	83.98
Sulphur, percent	4.0	3.9	3.5	3.8
Gravity, degrees B.....	15.4	15.4	15.4	15.4
Specific gravity.....	0.963	0.963	0.963	0.963
Flash point, degrees F.....	166	166	166	166
Burning point, degrees F.....	254	254	254	254
Heating value, B.t.u. per pound	18,382	18,418	18,248	18,459
Flue-gas analysis:				
CO ₂ , percent	12.8	13.06	12.2	11.98
O ₂ , percent	3.3	3.0	4.4	4.4
CO, percent	0.03	0.17	0.61	0.06
N ₂ , percent	84.87	83.77	83.39	83.56
Weight of gas per pound of fuel, pounds	16.48	15.95	17.19	17.49
Boiler pressure, gage, pounds per square inch	172	174	172	168
Superheat, degrees	0	14	28	33
Moisture in steam leaving boiler, percent	0.62	0.64	0.62	0.47
Drafts and air pressures (inches of water):				
Furnace	-0.14	-0.22	-0.31	-0.64
Below superheater	-0.15	-0.25	-0.48	-0.78
Base of stack	-0.15	-0.31	-0.57	-0.84
Gas temperatures (degrees F.):				
Leaving boiler	448	525	589	548
Leaving superheater	420	473	503	490
Total water fed to boiler, pounds...	32,276	41,282	61,813	66,348
Feedwater temperature, degrees F.....	232	212	191	212
Equivalent evaporated steam from boiler, pounds per hour per square foot of heating service	3.63	5.69	6.79	7.68
Actual evaporation, pounds per pound of oil fired	15.29	14.39	14.02	14.35
Efficiency of boiler without superheater, percent	82.35	78.98	79.29	78.70
Smoke, Ringelmann scale	1.5	1.75	1.5	2.5
Heat balance:				
Heat absorbed by boiler and superheater, percent	82.9	80.2	81.1	80.6
Loss due to moisture in fuel, percent	0	0	0	0
Loss due to burning hydrogen in fuel, percent	5.7	5.7	6.0	6.1
Loss due to heat carried away in dry gas, percent	7.1	8.4	9.6	9.4
Loss due to CO, percent	0.1	0.6	0	0.2
Loss in unconsumed oil and unaccounted for, percent	4.2	5.1	3.3	3.7
Heat in fuel as fired, percent	100	100	100	100

0.513 pound of oil per hour per square foot of heating surface and showing efficiencies ranging from 80.6 to 82.9 percent. Fig. 8 gives the average efficiency values obtained from all of the tests of this class.

SUMMARY

In comparing Figs. 7 and 8, the fact must be kept in mind



Fig. 5.—Scotch Marine Boiler as Fitted with Bethlehem Burners for Induced-Draft Tests

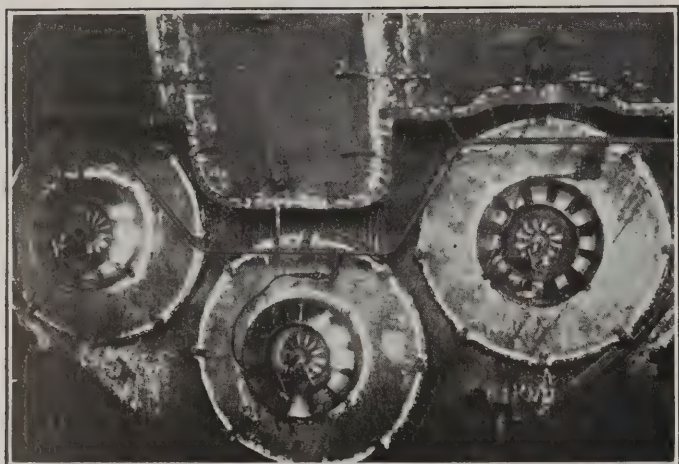


Fig. 6.—Scotch Marine Boiler as Fitted with Enco Burners for Induced-Draft Tests

that the induced-draft tests did not have the help of the air heater in building up furnace efficiency.

From the foregoing data it will be seen that the Scotch marine boiler is capable of efficiencies considerably in excess of the average operating values obtained, and it is, therefore, a matter of simple calculation to show what considerable fuel savings are possible when reasonable supervision is shown on the part of the operating force.

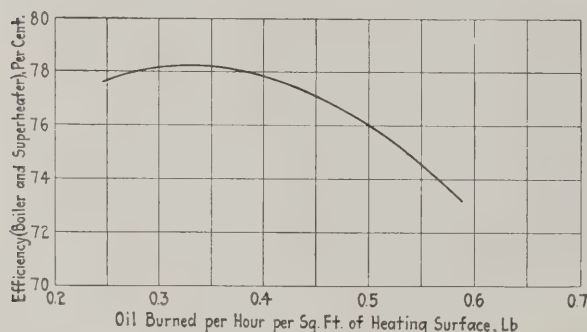


Fig. 7.—Average Combined Efficiency Values Obtained in the Forced-Draft Oil-Burning Tests

(1,002.46 × pounds oil per square foot of heating surface = oil per burner.)

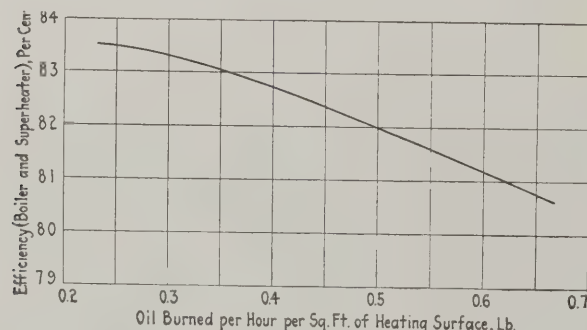


Fig. 8.—Average Combined Efficiency Values Obtained in the Induced-Draft Tests

(1,002.46 × pounds oil per square foot of heating surface = oil per burner.)

[EDITOR'S NOTE.—Photographs of all the burners used in the tests were submitted to the American Society of Mechanical Engineers with the original paper. The selection of illustrations was made by the editor of *Mechanical Engineering*, in which the paper was first published and from which the above abstract is reprinted.]

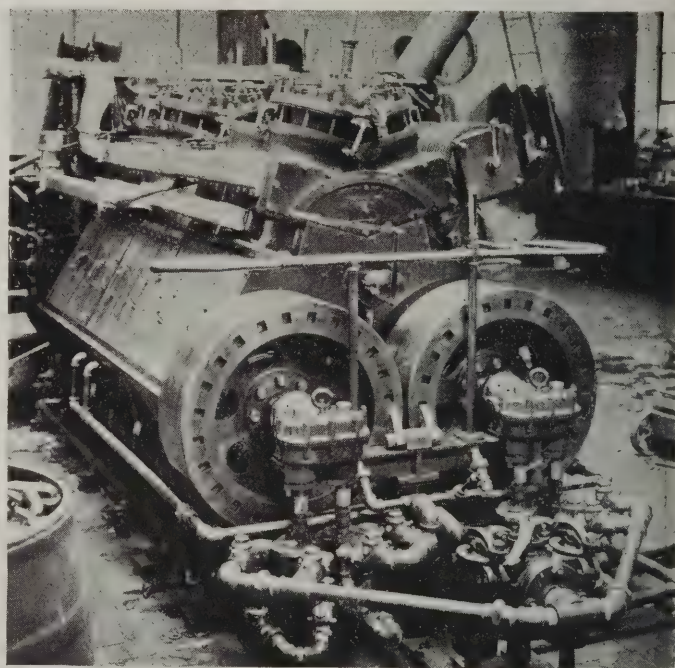
Improved Scavenging Two Cycle Oil Engine

TWO cycle Diesel engines, ranging upwards from 50 horsepower to any power required, or from 4-inch cylinder bore, have been developed by the Knudsen Motor Corporation, 30 Church street, New York, claiming as their greatest feature practically 100 percent scavenging efficiency. The Knudsen engine is designed for either electric or direct drive and has an extremely light weight per horsepower.

It is claimed that the high fuel economy and mechanical efficiency are obtained by the elimination of all but four mechanical motions. The fuel pump is operated by a cam and the fuel valve is automatically actuated by the impulse of the fuel pump. The crank shaft is operated by the connecting rod which in turn is moved by the piston. Air in the cylinder when expanding gives an impulse to the piston. A long period of expansion is obtained, due to the short exhaust ports which are 10 percent of the stroke. From this it will be understood that all exhaust and scavenging valves and complicated casings have been eliminated. The thorough scavenging effect combined with the design of the cylinders produces the necessary mixing of the pure air charge within the cylinders and accomplishes complete combustion.

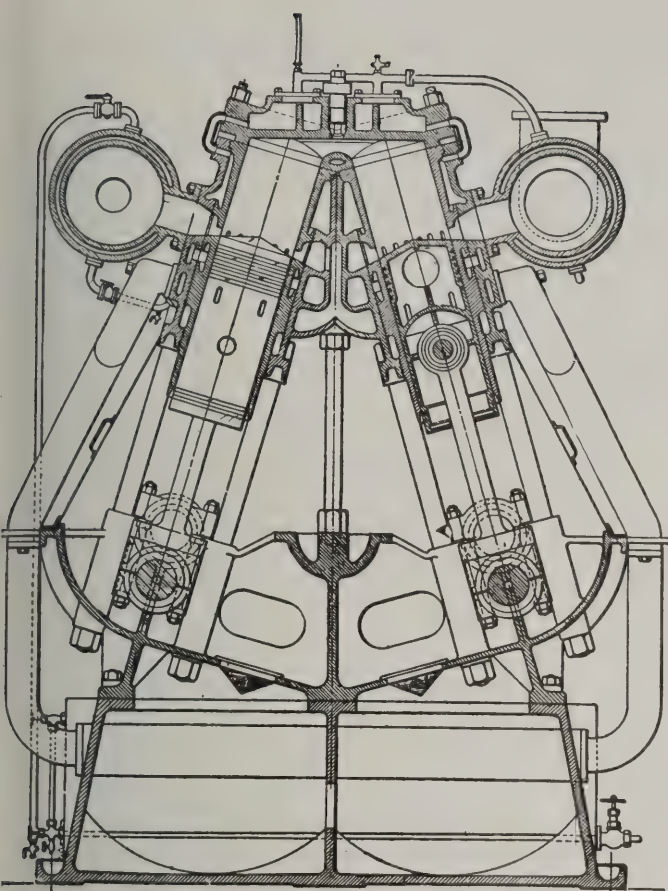
PISTON CONTROLLED PORTS

The pistons are arranged so that the one controlling the exhaust ports uncovers them before the scavenging ports there-



Knudsen Engine Erected for Shop Tests

by allowing the exhaust gases to escape to the atmosphere and lowering the pressure to atmospheric thus precluding the possibility of the exhaust gases blowing back into the scavenging system. The pistons working up and down at the same time control the period of the exhaust as well as the scavenging period. The early opening of the exhaust ports is accomplished by advancing the right side piston a certain number of degrees ahead of the left side piston which controls the opening and closing of the scavenging ports. The earlier opening of the exhaust ports results in their earlier closing, thus permitting the cylinders to become charged with pure scavenging air at scavenging pressure after thorough scavenging takes place and before compression commences. This results in what is termed super-charging, the ad-

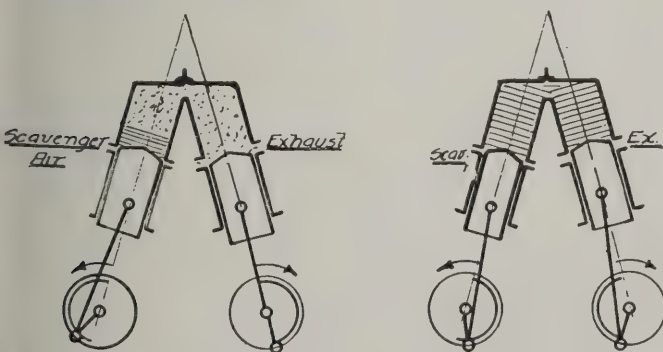


Cross Section of Engine Showing Arrangement of Cylinders and Ports

vantage being that greater expansion takes place while consuming the same amount of fuel, with the result that higher economy and more complete fuel combustion are obtained. Super-charging varies with different speeds and powers—varying from 10 to 30 percent for the greater speeds and higher powers.

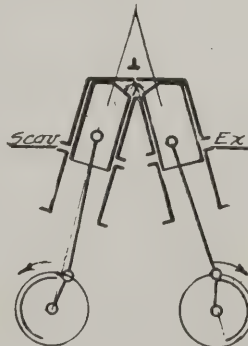
METHOD OF SCAVENGING

Thorough scavenging is secured in the Knudsen motor by introducing two-thirds of the volume of scavenging air into the cylinders through ports circumferentially arranged upon the cylinder walls. One-third of the air is passed through the piston heads to act as a cooling agent for the pistons. This air absorbs a certain quantity of heat in moving through the pistons which increases its volume as well as its velocity, after which it finally passes into the cylinder through the circumferential ports to assist the larger amount of air blowing through the scavenging ports and to complete the expulsion of burnt gases.

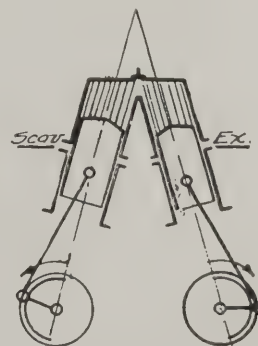


Exhaust piston full open, when scavenger commences to open.

Supercharging.



Compression fuel valve open for injection.



Working stroke.

Diagram of Scavenging and Supercharging of Knudsen Motor

The scavenging pump which supplies the air at 2 to 3 pounds gage pressure for scavenging the working cylinders is so designed that a ratio of $1\frac{1}{2}$ to 1 exists between its cylinder volume and that of the working cylinders, thus insuring a sufficient quantity of air even at low speeds to perform its function.

AIR-COOLED PISTON

The pistons are cooled as noted above by passing a third of the volume of scavenging air through them, thus eliminating the usual method of piston cooling by means of water or oil carried to the pistons by telescopic pipes. Water especially in most engines is a constant source of trouble since there is always danger of its entering the lubricating oil systems; the greatest care must be maintained on the part of the operators to prevent this leakage.

Crank shafts are made to pass the highest requirements and are both statically and dynamically balanced in order to reduce vibration. With the exception of the spray valves, there are no valves necessary for the intake of air or the exhaust of burnt gases so that cam shafts, valves and their openings and closing gear and springs are eliminated.

Fuel is injected to the cylinders through the spray valves by a multiple plunger pump cam-actuated. The amount of fuel supply to each cylinder is controlled by this pump under a pressure of 100 pounds. The pump also acts as a measuring device to regulate the amount of fuel for each cylinder. The pump control is arranged so that the injection of fuel can be retarded or advanced while the engine is in service.

TYPES OF DRIVE

The engine can be geared down to the most economical propeller speed by means of a quill type floating pinion and gear. The pinions are made of the finest chrome nickel steel, a material which has proved to be excellent for marine service. The pinion acts in such a way that the teeth of the gear are covered by the necessary film of oil when working which prevents direct metallic contact between the teeth of the pinion and gear thus insuring long life.

Westinghouse Company Develops Automatic Sectional Type Electric Bake Ovens for Marine Use

A NEW type of electric bake oven that, because of its economy, flexibility, and compactness and the high quality of its product is particularly well adapted for marine service has recently been developed by the Westinghouse Electric & Manufacturing Company. This new oven, which is known as the automatic sectional-type electric bake oven, is constructed in sections, each of which is independent of other sections and is entirely automatic in its operation.

The sections are made in two standard sizes, one with a capacity of 20 and the other of 60 loaves.

Each section is equipped with motor operated snap switches, a thermometer and a thermostat for controlling the oven temperature. The heating units, which are entirely enclosed, are mounted at the top and bottom of each section and are distributed so as to give a uniform temperature throughout the baking chamber.

The temperature of these ovens is controlled by an arm projecting through the metal control box at one end of each section. By moving this arm along a graduated scale, oven temperatures ranging from 300 to 500 degrees F. can be obtained. When the temperature in the oven section gets



Battery of Westinghouse Sectional Type Bake Ovens, Each of Which Consists of Two 60-Loaf Sections

too high, the thermostat, operating through the motor operated snap switch shuts off the current automatically and turns it on again when the temperature has dropped. It is thus possible, it is claimed to keep the temperature within ten degrees of the operating temperature without any attention whatever.

Because of the independence of the sections and the efficiency of the insulation between them, different temperatures can be maintained in each section and a number of products, limited only by the number of sections in the installation, can be baked at one time. A new section can be added to the installation at any time, if the need arises.

United States Battleship Colorado

(Continued from page 608)

are of sufficient capacity to open the circuits under full power and full voltage, although in normal operation, the circuit breakers are never opened or closed under load. The levers for manual operation of the circuit breakers are located directly in front of the control room instrument board, and are connected to the circuit breaker operating mechanisms through a system of bell cranks and rods. The arrangement of the operating levers is such that the operator faces forward. The operating levers are interlocked to prevent improper operation. The primary circuit breakers are located in the control room and are arranged in two rows athwartship with an aisle between them for inspection and repair. The secondary short circuiting breakers are located in the motor rooms and are operated from the control room. The liquid rheostats for controlling the motor secondaries are located in the control room. In order to disconnect circuits completely, self-contained disconnecting devices have been provided on the reverser and generator circuit breakers. The mechanism is so arranged that the circuit breaker must be opened before it is possible to disengage the disconnecting device. This provision safeguards the men in case of improper or faulty operation, and at the same time makes it possible to inspect or repair a circuit breaker while the ship is under way.

The levers operate the circuit breakers and rheostat valves in pairs, and are arranged in a single row, directly aft of the circuit breaker structure. The arrangement is symmetrical so that levers on the left of the central position operate the circuit breakers in the after generator and port motor circuits; while those on the right of the central position operate the circuit breakers which control the circuits of the forward generator and starboard motors. All the levers are mechanically interlocked so as to insure the proper sequence of operation. The scheme of interlocking is such that the field must be off and the steam control reduced to a low setting before any of the above circuit breakers can be operated.

With two generators in operation, the control of the port and of the starboard side of the ship are independent. With the tie circuit breaker closed, and one generator in operation, the direction of rotation of port and starboard screws may be in the same or opposite directions, but of necessity must be at equal speeds.

All starting and maneuvering is done with the 24 pole connection. When the motors are thus connected, the secondaries are controlled during starting and reversing by means of liquid rheostats. There is one double rheostat for the port motors and one for the starboard motors. The rheostat consists essentially of a two-compartment tank, the lower compartment of which serves as a reservoir for the electrolyte, and also as a container for the cooling coils, while the upper compartment contains the electrodes. When it is desired to use a rheostat, the valve in the upper compartment is closed by means of a lever operated from the control stand, thus allowing the liquid to rise in the upper compartment. After the maximum level has been reached, the motor secondary is completely short-circuited by means of an oil circuit breaker which is operated by a lever from the control stand.

The generator field excitation is adjusted by means of a field lever in the control room, which controls the generator field of a motor generator booster set. The booster generator is connected in series with the generator field and functions to either boost or buck the 240 volts supplied by the auxiliary generator which furnishes excitation and auxiliary power. With this arrangement, the required value of generator field excitation is obtained most economically.

The protection for the propelling machinery is provided by a ground detector system, which automatically indicates a ground and also the circuit in which the ground exists, and by unbalanced phase relays which are arranged to trip out the generator field switch in case of any appreciable unbalance in the loadings of the different phases, which might be caused by grounds, short circuits, or otherwise.

SAN FRANCISCO PORT RECORDS BROKEN DURING JULY.—With a total of 1,198 vessels passing through the port of San Francisco during July, all records were broken. There was more activity along the San Francisco water front during that period than for any similar period in the history of the port. Of the total number of vessels passing through the port 616 were arrivals and 582 departed. The 616 arriving ships represented 1,432,819 tons while the 582 departing vessels represented 1,306,416 tons, or a grand total cargo of 2,739,235 tons. The enormity of the gains in commerce, with its resultant prosperity, is vividly shown by a comparison with the figures of July, 1922. In that month the arriving ships numbered 499, showing an increase in favor of July this year of 117 ships. The departing ships in July, 1922, numbered 478, a gain of 104. In tonnage, the July, 1922 arrivals aggregated 1,021,537 tons showing an increase for the past July of 411,282 tons over the same month a year ago. The departing tonnage for July, 1922, was 999,602 tons, showing an increase for July, 1923, over the corresponding month of the previous year of 306,814 tons.

Surplus Tonnage Problem Confronts Great Britain

Scheme for Disposal of Obsolete Ships Unfavorably Received—British Banks Suffer from Shipping Ventures—Imperial Economic Conference

By a Special London Correspondent

ONE of the most interesting exchanges of views in recent times is taking place in United Kingdom shipping circles on the subject of excess tonnage. It has been put forward that the British Government should make an annual grant of about two and a half millions sterling to provide for the total extinction each year of a million tons of obsolete merchant ships. A process of gradual extermination, spread over a period of four years, is the policy advocated.

The beneficial effect of withdrawing, by degrees, some four million tons gross of "obsolete, uneconomical vessels" from maritime service is regarded by the shipping man responsible for the suggestion as "inestimable." Freights, he states, would be assisted to a profitable level, large sums of money wasted upon costly repairs and renewals to worn-out "Methuselahs" of the mercantile fleet would be saved and set aside, and, to quote, "with the advent of a steady all-round improved shipping position, the production of new tonnage would be warranted, and our shipbuilders and engineers would no longer be among the ranks of the unemployed. And, if Great Britain's useful lead were followed by an international movement towards the same desirable end, so much the better for shipping and the world at large."

GOVERNMENT MEDDLING OPPOSED

And so much for the scheme in outline. Frankly, however, it is not meeting with anything like a large measure of sympathy. Its opponents are, in fact, numerous, and decided in their published and unpublished views. Even were Government approval of the plan forthcoming (and this, in the present condition of State engagements and commitments, is regarded as next to impossible) it is felt that to invite the Government to take a "hand" in the conduct of the shipping industry would be asking for trouble. The originator of the scheme gibes at the opposition's fear of the "spectral but affrighting head" of the ghost of Government interference. Yet the danger is none the less real, and for his reason, apart from all others, the plan is scarcely likely to be adopted.

But perhaps the most telling argument against the adoption of the proposal is that shipping people are dead against the institution of artificial measures in endeavoring to remedy the surplus tonnage problem. They hold the view that economic alleviation is only to be found in taking advantage of natural expedients. Curiously enough, the interests whom the scheme is primarily intended to benefit are opposed to the "subsidy" suggestion. One leading builder does not think there is anything in the plan particularly attractive to shipbuilders as a sound economic proposition. If, he says, these millions of tons of vessels are obsolete in the fullest sense of the word, then they may as well be, for practical purposes, deducted from the statistics. As to subsidies, he does not consider that, either for themselves or other industries, shipbuilders will favor the principle.

Ship repairers are not enamored of the proposal—some, indeed, view it with grave doubts. One authority points out that a principal source of employment for ship repairers' workers and their plants is the survey work, which increases with the length of life of the ships. Moreover, this expert fears that shipbreaking, always a speciality and largely carried out on the continent, would prove a poor substitute for

this department of their services, the repairs necessary to maintain old ships in a seaworthy and efficient state.

AMERICAN PROPOSAL CONSIDERED IMPRACTICAL

Plans to rectify the international shipping position, however, are not confined to this side of the Atlantic, and in this regard interest is being displayed here in the New York proposal that there should be a plan of co-operation between American and foreign steamship owners as a remedy for the world's shipping ills. Under this scheme, American and foreign owners would each furnish one-half the tonnage required to move the freight over a particular route, each acting as loading agent for the other, and the ships of each working on an alternative schedule. While the plan would benefit at all events some interests, British shipping people regard it as unworkable, for the reason that no agreement could be come to which restricted the trade to specified vessels at, presumably, specified rates. The originators of the scheme would seem to have made provision for damping the enterprise of any "tramps" which might, consciously or unconsciously, make their appearance where least wanted, but there are reasons for stating that, whatever may be arranged between the principal lines, the tramp would at one stage be bound to enter, incidentally wrecking the agreeing lines' calculations. Furthermore, it is considered that there would have to be a very substantial inducement before British shipowners would agree to exclude all British vessels from trading between America and the East and to the Continent.

ENGLISH BANKS HARD HIT BY SHIPPING LOANS

One phase of the shipping position which is becoming more and more clear as the months go by is the part the great banks have played, both during the boom that is past and the slump that is still in evidence. Practically every one of the great banking institutions in England—concerns admittedly expert in regard to general finance, but completely "at sea" where shipping subjects were in question—engaged during the good times in lending fabulous sums of money on vessels which in normal times would realize only a tithe of their boom-time "values." These banks, almost without exception, are now paying very dearly for their inexperience and their excessive indulgence in matters maritime.

But they are clinging to the boats which fate, in the guise of shipwrecked steamship companies, has thrown on their hands. Shipping experts regard this as a foolish policy and condemn the banks, firstly, for advancing tremendous amounts to "mushroom" shipping concerns, and, secondly, for not clearing out of shipping the moment it became evident that the market was going to smash. The banks, however, are most reluctant to relinquish the vessels on which they lent so much money, and, it would seem, intend to hold them indefinitely in the hope of better times.

Meanwhile, an uncomfortably large number of steamship companies are operating on a hand-to-mouth basis; in some cases managers are still running their boats, but they are only enabled to do so in consequence of the indulgence of the mortgagees in refraining from foreclosing and in permitting the managers to continue working on condition that they finance the voyages. Then again, in notable instances, if the income tax authorities exercised their undoubted rights,

and pressed for payment of the large sums outstanding under this head, there are companies which would be bound to smash.

Incidentally, it would seem that a Norwegian bank has its own little way of getting over the mortgage difficulty, for it is understood to have taken over the steamers, formed them into a company, and placed a friend—presumably a shipping man—in the position of manager.

EXCESSIVE PORT CHARGES IN AUSTRALIA A SERIOUS OBSTACLE

The Chamber of Shipping of the United Kingdom is adopting a strong attitude on the subject of port charges, notably in Australia and New Zealand, where the costs are considered to be out of all proportion. The chamber has observed the continuance of high port charges, light dues, pilotage rates, quarantine expenses, and other terminal costs in Australian ports, "at rates which are far in excess of anything obtaining in this country," and urges upon the Federal and State Governments that such charges constitute a serious obstacle to the free development of Australian trade. Further, it is pointed out that, in respect of all similar charges in the United Kingdom, drastic reductions have been made, so that, speaking generally, charges do not now exceed 40 to 50 percent above pre-war. The instance is cited of an 11,000-ton cargo steamer which, making a stay of five days in port, pays 55 to 62 percent more in dues in the United Kingdom than in 1913, 58 percent more in South Africa, but in Australia 148 percent more. In this connection it may be of interest to note that the dock dues and charges in the principal United Kingdom ports compare as follows with the last pre-war year:

Port	In excess of 1913, Percent
London	47.50
Liverpool	72.00
Glasgow	58.33
Newcastle	70.00
South Wales ports	60.00
Southampton	66.66
Hull and North-East Coast ports.....	75.00

Eighteen months ago these charges stood at 150 percent above pre-war, but then the shipping and commercial organizations got busy and induced the port authorities to fall into line with declining costs. The people principally concerned fail to see why Australia cannot do the same.

Another leading subject in regard to which the Chamber of Shipping is showing the liveliest interest is in connection with the taxation of shipping profits abroad. The chamber's efforts to induce the Government to introduce legislation with a view to adopting the United States proposal in regard to the exemption of shipping from taxation on a reciprocal basis having met with success, the chamber is now engaged in urging the authorities on this side to do all in their power to persuade all the leading maritime nations to enter into a similar reciprocal arrangement.

SHIPPING PROBLEMS TO BE DISCUSSED AT ECONOMIC CONFERENCE

As all the world knows, the Imperial Economic Conference is scheduled to be held in London in October this year, and it is satisfactory to note that the future of the shipping industry is to find a prominent place in the weighty deliberations which the conference will doubtless produce. So many things may happen before these lines see print that it would be futile to anticipate to any great extent the probable outcome of the conference. But that is no reason for withholding from placing on record what representative British shipping interests have done, and are doing, in the light of the forthcoming conference.

When Sir Ernest Glover, the President of the Chamber

of Shipping, was appointed as a member of the Board of Trade Advisory Committee in connection with the conference, a special committee was appointed by the shipping industry, representative jointly of the Chamber of Shipping and its scarcely less eminent "colleague," the Liverpool Steamship Owners' Association, with the primary object of framing a statement of the views of the industry upon the subjects which it seemed probable would be discussed at the conference. The committee has now embodied its views in a lengthy statement in the course of which it is reiterated that Government enterprises should be put on an equal footing with private enterprises in all respects—for example, taxation, liability and equality of opportunity—and that the Government of the Empire should be urged to abandon all shipping ventures. State ownership the committee is convinced is injurious to private enterprise and involves either a burden on the taxpayer or higher freights and less efficient services and is a constant cause of international discord.

DISCRIMINATION

As to discrimination, the committee maintains that the effective resistance of Great Britain to attempts by foreign countries to impose restrictive and discriminatory measures upon British shipping is limited by the extent to which the Dominions will co-operate with her. A United British Empire, it is felt, could compel discriminating countries to give equal opportunity to British shipping and that under their own or other flags, and it is suggested that the Imperial Economic Conference should agree that all parts of the Empire should stand and act together to secure this.

In regard to air communications the committee is refreshingly brief. Shipping, it says, should be left to itself to deal with the competition of air services. The help given by the State to air services should be only such as is necessary in the national interest.

FINANCIAL DIFFICULTIES OF PROMINENT SHIPYARD

The position of the shipbuilding industry of the British Isles may be best summed up in a review of the unfortunate financial affairs of one of the leading companies—Messrs Workman, Clark and Company, Ltd., of Belfast—as revealed by an official investigation.

To go back to the beginning, rumors circulated that the company would be unable to meet its debenture interest obligations at the fixed date, and, in consequence, the Stock Exchange quotation of the debentures experienced a huge slump. However, the interest was paid on the day on which it fell due, but it transpires that the company was only able to disburse the necessary sum following the sale of a portion of its holding in other companies. Moreover, the sinking fund instalment due on June 1 has not been paid owing to the fact that the company has insufficient cash available. To add to the trouble, it is now made clear that the Northumberland Shipbuilding Company, Ltd., of Howdon-on-Tyne, which owns the whole of the Workman Clark shares, and which had guaranteed the interest on the Workman-Clark debentures, is unable, owing to financial reasons, to fulfill its obligations.

It was, of course, generally appreciated that, due to the abnormal depression in the shipbuilding industry, companies carrying on this class of business must be having a pretty poor time, but the revelation that, so far as the two companies named are concerned, the situation is worse than was anticipated, caused an unpleasant shock in the shipping and shipbuilding world. What the future holds for either of the companies is, at this writing, not yet clear, but, in regard to Workman, Clark and Company, one point on which there is no doubt is that two or three hundreds of thousands of pounds sterling of new money must be provided if the company is to clear itself of more pressing obligations, and still have capital in hand with which to carry on.



Sketch Showing How the New D. & C. Passenger Steamship Greater Detroit Will Look When Completed

Largest Great Lakes Passenger Steamer Launched

Vessel Is First of Two Sister Ships for D & C Navigation Company and Is First Passenger Steamer Launched on the Lakes Since the War

WITH the launching of the first of the two new steamships of the D & C Navigation Company at Lorain, Ohio, on September 15, the first authentic details of the largest inland waterway steamers in the world were made public by A. A. Schantz, president and general manager of the company. The second of the sister ships will be ready for launching in about three months.

The hulls of these two sister steamships were built by the American Ship Building Company of Lorain, Ohio, and when completed they will compare with many of the transatlantic steamships. Their design is the result of a life-long study by Frank E. Kirby, the noted authority on Great Lakes steamers. The total cost of each steamer will be about \$3,500,000.

The construction of these boats required unusual study to meet the conditions imposed by the high speed run between Detroit and Buffalo, the routes these vessels are to follow being complicated by shallow channels and the traversing of the entire length of Lake Erie. The trip is slightly more than 260 miles and it must be made day in and day out on schedule to meet certain trains. It was also necessary to construct the boats so that they would not only be "floating hotels" but would also carry a large number of automobiles and express freight.

In general, the design follows the conventional side wheel steamer characteristics, having a refined steel hull, carrying a great superstructure of wood supported by braces. It is interesting to note that these superstructure decks are each about three-quarters of an acre in area. The type of the stern is unusual, and has not been used before in this type of vessel, being of an unusual width.

PRINCIPAL DIMENSIONS

Length overall	550 feet
Beam, molded	58 feet
Beam, over guards	100 feet
Depth	23 feet 6 inches
Cargo capacity	1,000 tons
Number of passengers	about 1,200
Horsepower	10,000
Speed, miles per hour	21

Some idea of the exceptional size of the vessel may be gained from a statement of the number of rooms on the various decks. On the promenade deck there is a total of 205 rooms, including 12 parlors and baths; several others have shower baths. On the gallery deck there is a total of 254 rooms, including 12 parlors and bath rooms. On the upper deck there are 166 double berth rooms, and an entire boat has 650 rooms. The total number of passenger berths and beds number 1,200. In addition to this, there are, of course, a great many accessory rooms not only for the use of passengers, but also for housing and maintaining the crew, and for taking care of the demands of the passengers as well as for the operation of the vessel.

RUDDERS AT BOW AND STERN

For steering the vessel there are two rudders, one at the bow and the other at the stern. The rudder at the bow is necessary to facilitate the handling of the boat in narrow waters at each end of the run. The stern rudder is of the balanced type and is operated by twin independent steering engines acting direct on the quadrant. These steering gears are both controlled from the pilot house.

There are eleven watertight compartments in the length of the vessel, formed by steel watertight bulkheads extending from the keel to the main deck. The double bottom is sub-divided into sixteen watertight compartments.

Accommodations for the deck, engineers' and stewards' departments are on a steel deck both forward and aft of the machinery. The freight space is on the main deck forward and the lobby entrance, cafeteria and dining rooms are aft on the main deck, with the galley and pantry on the orlop deck. Passenger accommodations are on the promenade, gallery and upper decks.

WOOD WORK

In vessels of this type the wood work is a most important item, depending upon a combination of strength, durability, beauty and lightness. To secure these necessary qualities, the principal structure is built of white pine using the best

clear California redwood for decks and partitions and Oregon fir for other parts.

The following parts are finished in selected figured mahogany: Lobby, main stairs, dining room wainscot, serving stands, cashier's desk and screens, sideboards, hat racks, doors, windows, trim and blinds, purser's office, steward's office with their desks, ticket racks, doors, windows, blinds, berths and fittings; lunch room wainscot, promenade deck salon, including stairs, side cross passages, stanchions and balustrades around wells at gallery and upper decks.

The following parts are finished in walnut: Doors and trim in the main salon, including stairs, rails, balustrades at gallery and upper decks, stanchion and stringer casings. The smoking room will be paneled in maple.

The parlors which have a hardwood finish will be done in the following woods: Two of mahogany, two in white mahogany, one in white maple and one in satinwood. The scheme of paneling and decoration will be of different "periods" in the several suites.

The main lobby will be finished in the Spanish style, and have rubber tiled deck, while the dining room will be in the Colonial style of architecture. In the great central salon the Italian Renaissance style prevails.

PLUMBING

As all the rooms are fitted with running water and many with baths, the amount of plumbing work is very great. Water is carried in steel tanks of 36,000 gallons capacity and there are tanks for 8,000 gallons of sterilized water, which after being chilled is pumped to drinking fountains throughout the vessel. Sterilized water is piped to all wash basins and generally throughout the ship. The violet ray system is used for sterilizing.

HEATING AND VENTILATION

As the greater part of the operating season occurs during the heat of summer, the ventilating problem has received very careful attention. Sheet metal ducts lead fresh air to all inside rooms. Fans driven by motors are located on the main deck and drive the air through washers into the ventilation ducts which distribute it to all parts of the vessels.

To prevent as far as possible the heating of the air in the ship, a great deal of money is being spent on the installation of engine and boiler casings and the under side of decks and at other parts of the structure, so that heat will not be conducted to the passenger quarters.

Radiators have also been provided in the public rooms and a heating pipe is run through the outer row of rooms and wing passages in order that heat may be provided when necessary.

SAFETY APPLIANCES

The entire vessel has been provided with a sprinkler system. In case of fire, fire detectors alarm the watchman of a rise in temperature at any point. The under side of the promenade deck is covered with galvanized sheet steel and fire doors have been provided in the cargo quarters and passages leading to rooms, thus dividing the vessel into zones.

Every room is provided with a telephone connected to a central station in the lobby.

In addition to life rafts and floats, twelve metal lifeboats of 60-person capacity and one metal work boat are carried.

Light and power for various uses are provided by three 100-kilowatt turbo-generators located on the main deck.

PROPELLING MACHINERY

The power plant consists of three double end and six single end boilers of the ordinary Scotch marine type, supplying steam for a three-cylinder compound inclined engine, driving side paddle wheels. These engines will develop 10,000 horsepower, and have a piston stroke of 9 feet. The side wheels have a diameter of 32 feet 9 inches, each having 11 paddles 14 feet 10 inches long by 5 feet wide.

The steamer will carry a crew of 300, including officers, and the cargo capacity will be about 1,000 tons. The speed of the boat will be about 21 miles an hour.

There will be two electric elevators, one for serving the linen room and galley and another automatic one between the main deck and galley.

A complete wireless set will be installed in each steamer in a room with accommodations for two operators, and motion picture equipment will be set up on both steamers.

Diesel Auxiliary Yacht Hussar IV

(Continued from page 603)

a companionway to the poop deck. The forward deckhouse, located just forward of the mainmast, contains the quarters for the wireless operator as well as the wireless apparatus, and in addition a large and well equipped chart room, having a deck toilet. This deckhouse has also been skillfully used to provide companionways for the officers and crew, thus avoiding the use of unnecessary obstructions on the deck.

One unusual feature of this new craft is the navigating bridge which has been placed just forward of the foremast and from which the captain has at all times an opportunity for navigating the ship without in any way being interfered by or interfering with the comfort of the owner and his guests. This bridge is so placed and so constructed as in no way to be unsightly or to interfere with the proper handling of the vessel under sail.

ACCOMMODATIONS

The arrangement below decks is rather novel, this portion of the vessel being arranged as follows:

The companionway from the after deckhouse runs athwartships and lands just aft of the mizzenmast on the center line of the vessel, there being a fore and aft passageway slightly on the starboard side of the centerline. At the forward end of this passageway the dining room has been placed, which is roughly 16 feet by 21 feet 6 inches.

On the starboard side is a pantry communicating with the crew's quarters as well as with the dining room.

At the after end of the fore and aft passageway and under the poop deck are the owner's quarters, consisting of two large staterooms and two separate bathrooms. These rooms not only have light and ventilation through the air ports and overhead skylights, but in addition have ventilating ports at the forward end where the deck level changes to the raised poop, which will provide excellent ventilation under all conditions.

Forward of the owner's quarters are four large double guests' rooms, each having a separate bathroom. Each of the staterooms and bathrooms is well ventilated not only by air ports but by overhead skylights.

The accommodations for the officers and crew have been arranged so that each department of the ship is segregated by itself, provided with ample and comfortable quarters, all being so arranged as to avoid any unnecessary labor in the maintenance of the vessel and in the service of food both to owner and guests and to officers and crew.

In order to reduce the number of the crew to a minimum, every advantage has been taken of the use of auxiliaries which are electric and include not only a windlass but also electric deck winches for handling boats and for making sail. The *Hussar IV* is lighted by electricity throughout, and is supplied with electric fans in every part of the living space. Forced ventilation is provided for use at sea when air ports and skylights must be closed, and the quarters throughout are heated by hot water. Included in the auxiliaries is an ice-making machine and in addition to ample storage space there is a large chill room, the temperature of which is maintained at any desired point by the use of the refrigerating machinery.

Applications of Arc Welding to Ship Construction—IV

Comparison of Cost and Percentage of Saving Obtained by Using Welded Instead of Riveted Joints

By E. H. Ewertz*

THE Ewertz type of electric arc welded ship as designed and patented by the author offers many novel features and is a radical departure from any previous design. It was gotten up with the idea, if possible, of eliminating all rivets and the features of construction inherent to riveting; in other words, the design is only adapted to electric welding and the construction is such that riveting cannot be substituted for welding.

It is the author's belief that substituting welding for rivets in a structure designed for using either method is wrong as a basic principle. The results derived from welding in such a method are, at least, partially defeated.

All of the structural shapes such as angle bars, tee bars,

tion keelsons and side stringers are suitably placed which together with transverse floor plates and plate frames form the proper construction. Deck construction is similar to side plating, and the whole structure when suitably welded produces an ideal construction that is even superior to that which could be obtained if the vessel were cut out of one solid block, because the fibers of the various parts are flowing in the proper direction. Accompanying sketches give a clear idea of the detail of construction.

ADVANTAGES OF EWERTZ DESIGN

In this as in other designs described, fully half of the welding can be performed before parts are erected and prac-

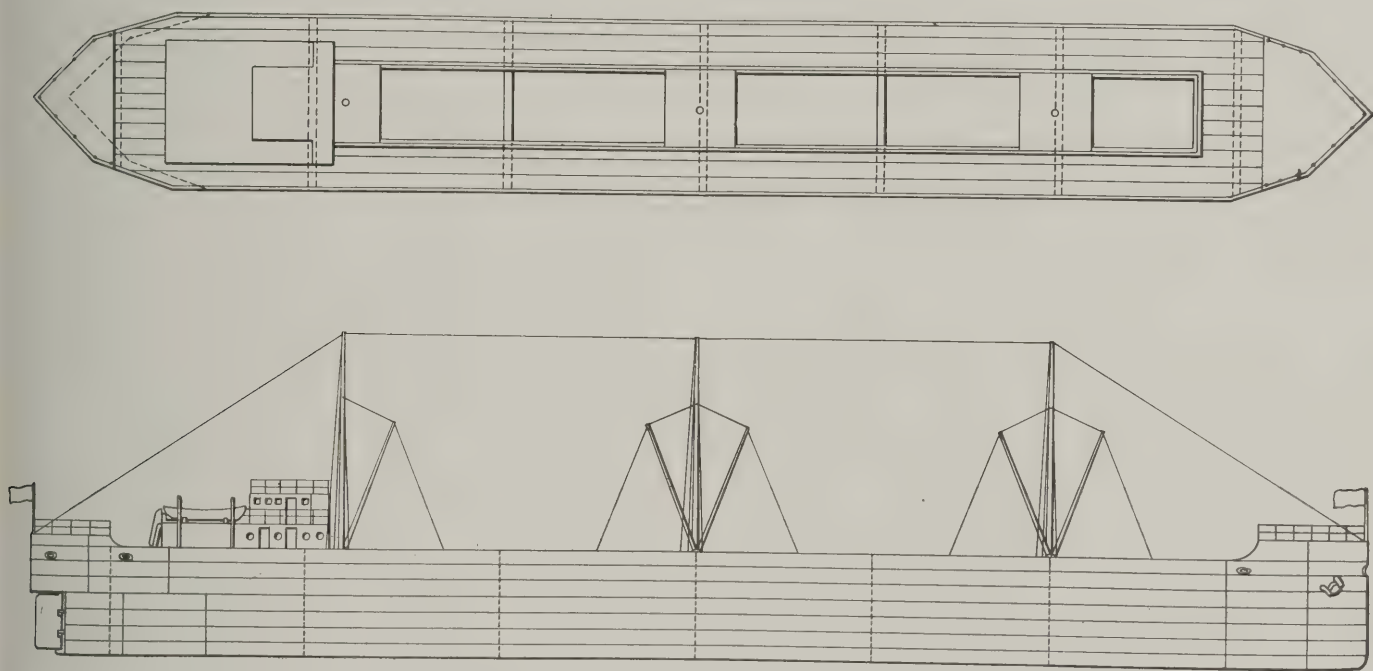


Fig. 76.—Deck and Outboard Profile Plans Ewertz Type of Electric Arc Welded Vessel

zee bars, etc., were designed primarily for convenience in riveting. One flange of an angle bar is used simply as a means of fastening the other flange in its proper position. It is only the outstanding flange that gives stiffness and strength to the plate construction and the flange used for fastening by rivets is valuable only for furnishing the place for the rivets and it does not add to the strength of the structure.

With this in mind, all flanges needed in the riveted structure for fastening are omitted and, in place of angles or other shapes, plates or flat bars are used. To produce reinforcement in many places, flanged plates are used but, in such cases, the flange on the plate performs the service of a stiffener.

The outer shell in this design is formed of metal channels or flanged plates, extending from the bow to the stern which are fastened together with welded butts. The flanges project inward thereby forming longitudinal stiffeners. In addition,

tically all overhead welding is eliminated except that required for filling in. Omission of all holes for fastening and the use of flanged plates in place of plates with bar stiffeners make each section or part much lighter, which reduces the cost of material very substantially. This type of construction also produces a complete ship with relatively few joints, thereby reducing the number of feet of welding. While the details shown illustrate a seagoing barge, these details are just as applicable to any type of ship construction.

A test carried out on a model barge built on 1/12 scale, with all parts in correct proportion, embodying the design above referred to as well as features of a patent now pending covering certain modifications in construction of floors and framing shows a remarkable increase in carrying capacity over that possible in an ordinary design of barge with riveted joints. The test also demonstrated that this type of design gave the structure extraordinary strength which was sufficient as shown in Fig. 81 to carry a 400 percent overload without any marked deflection.

*General Manager, Moore Plant, Bethlehem Shipbuilding Corporation, Ltd., Elizabeth, N. J.

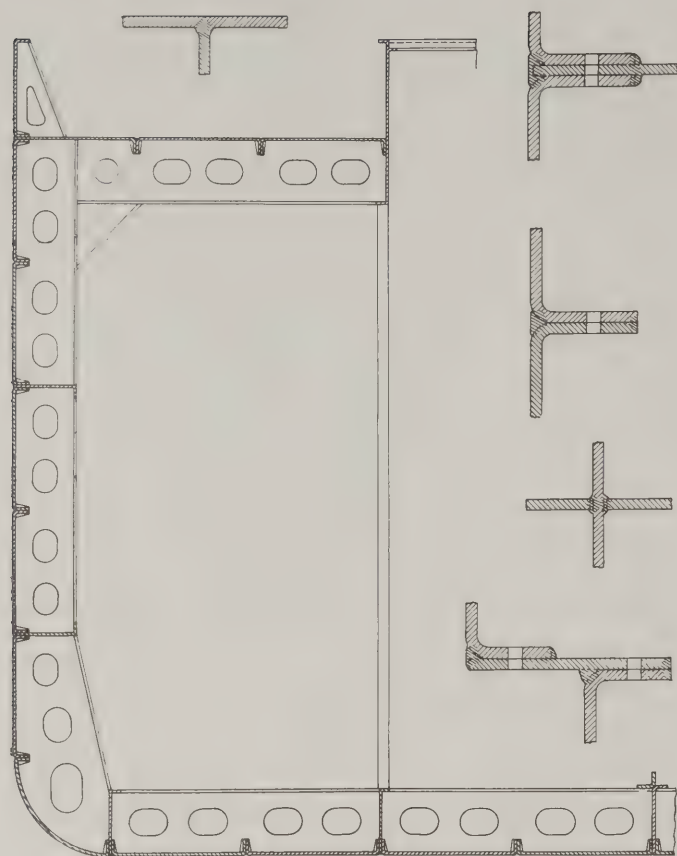


Fig. 77.—Midship Section, Ewertz Type of Electric Arc Welded Vessel

COST DATA

In the preceding pages we have tried to present to the designers and builders of ships what has been done in the past with electric arc welding as well as what might be done by this process, but in order further to assist in the work, we will now give data on the cost as well as on the strength of welded joints, and also a comparison of strength between the riveted and welded joint. Many books and papers have been published in connection with this subject, particularly pertaining to the strength of joints, and in addition to the statements made in this paper, further information on this subject may be obtained from publications in the bibliography which will be printed with the final installment of this article.

In a ship designed for all electric welding, estimates show a saving in weight of structural steel material of over 25 percent as compared with a similar design for a riveted ship. The hours of labor for hull construction show a reduction of over 20 percent. Modified designs, or designs where either riveting or welding can be used, while they clearly indicate a saving, show a saving that is naturally proportionately lower to that obtained in a ship designed for all electric welding.

Mr. Bonner gives some interesting figures in connection with the construction of a 1,200-ton oil barge built by the Tank Shipbuilding Company, Newburgh, N. Y., which are tabulated in the next column.

Major James Caldwell, in a paper read before the Society of Engineers and Shipbuilders in Scotland, with reference to the cross channel barge AC-1320 previously described, states: "In labor, 245 man hours were saved in the construction of this barge. More than 1,000 pounds of metal were saved by the substitution of welding for riveting and even greater economy will result when the design is modified to suit electric welded ship construction. Altogether, there were

Estimated Construction Cost of a 166-foot by 39-foot by 8-foot-8-inch Barge

Items	Riveted Design	Welded Design
Plate fitters	\$1,236.00	\$618.00
Punching and shearing.....	1,045.00	522.00
Countersinking and reaming.....	976.00	.....
Riveting	3,427.00	.....
Chipping and calking.....	523.00	265.00
Smithwork	557.00	275.00
Assembling	2,010.00	1,320.00
Electric power	382.00	95.00
Foreman	360.00	360.00
Plant .....	.....	300.00
Superintendence .....	.....	900.00
Rivets	780.00	.....
Liners	142.00	.....
Shed and shoring lumber .....	.....	145.00
WELDING—Assembling and construct- ing, 51,300 feet single fillet—		
Welders.. 6,000 hours @ 60c... \$3,600		
Current... 6,000 x 5.		
30,000 K. W. H. @ 2½c..... 750		
Wire, 7,200 pounds @ 6½c..... 450		4,800.00
Incidentals .....	.....	250.00
	\$11,438.00	\$9,850.00

7,000 lineal feet of welding on the barge and over 3,000 holes required filling-up when the service bolts were withdrawn. The total cost of welding was (based on normal exchange) \$1,462.86, comprising: Electrodes, \$865.08; electric current, \$296.46 and labor, \$301.32.

"The cost of assembling similar barges built in the same yard by the ordinary method of construction, including riveting, calking and drilling, was \$1,892.48, while in

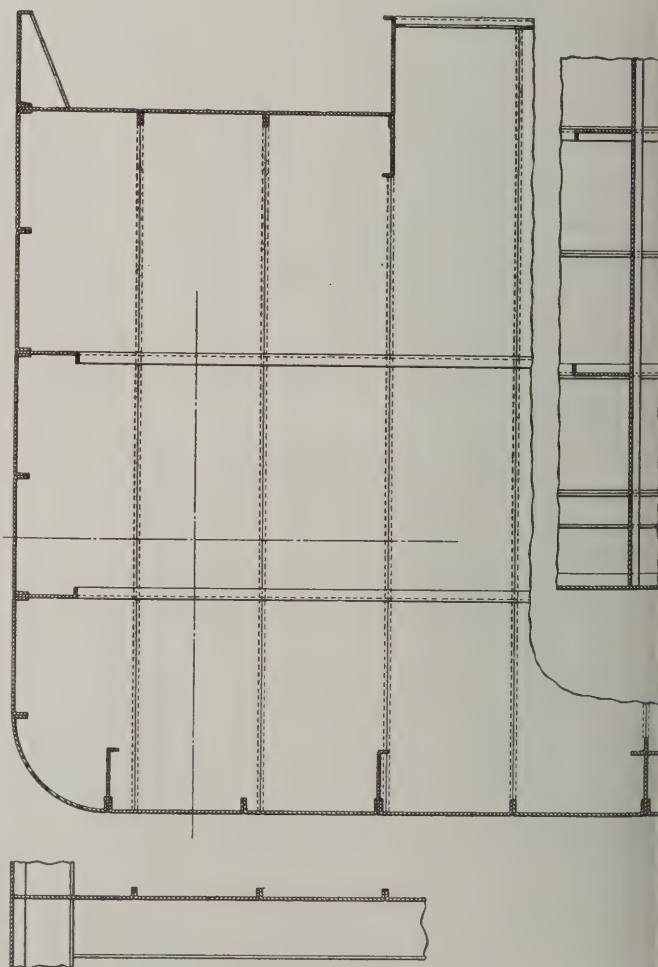


Fig. 78.—Bulkhead Construction, Ewertz Type of Electric Arc Welded Vessel

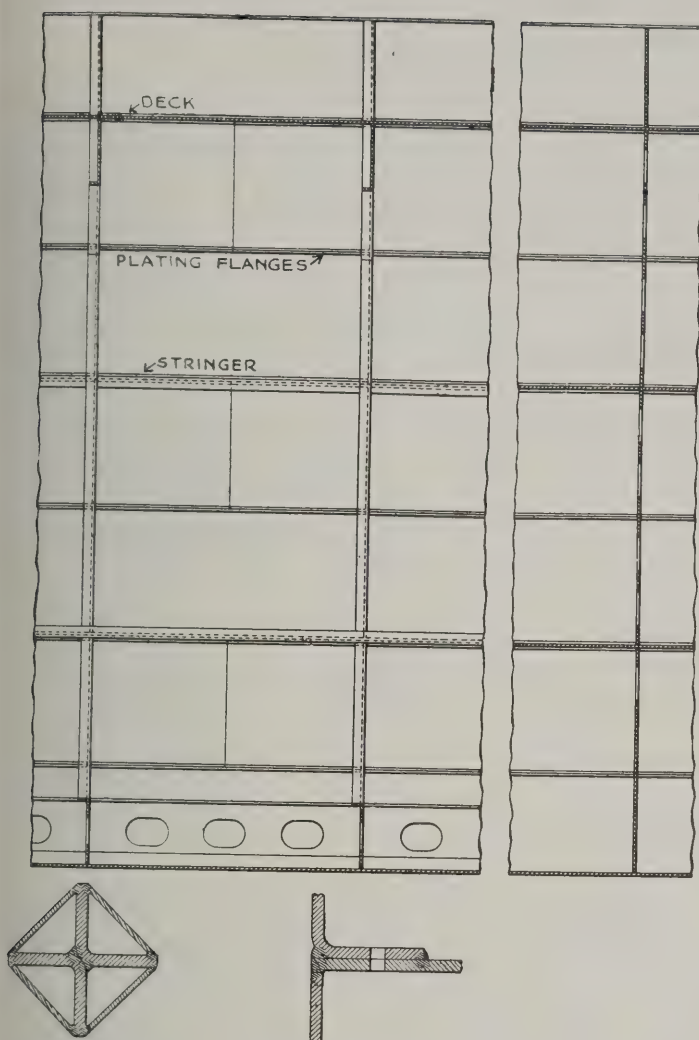


Fig. 79.—Inboard Elevation of Side Construction, Ewertz Type of Electric Arc Welded Vessel

another yard, where 10 barges were built, the average cost was \$2,203.52."

Major Caldwell's proposed design of an all electric arc



Fig. 81.—Model of Ewertz Type of Electric Arc Welded Vessel Carrying 400 Percent Overload

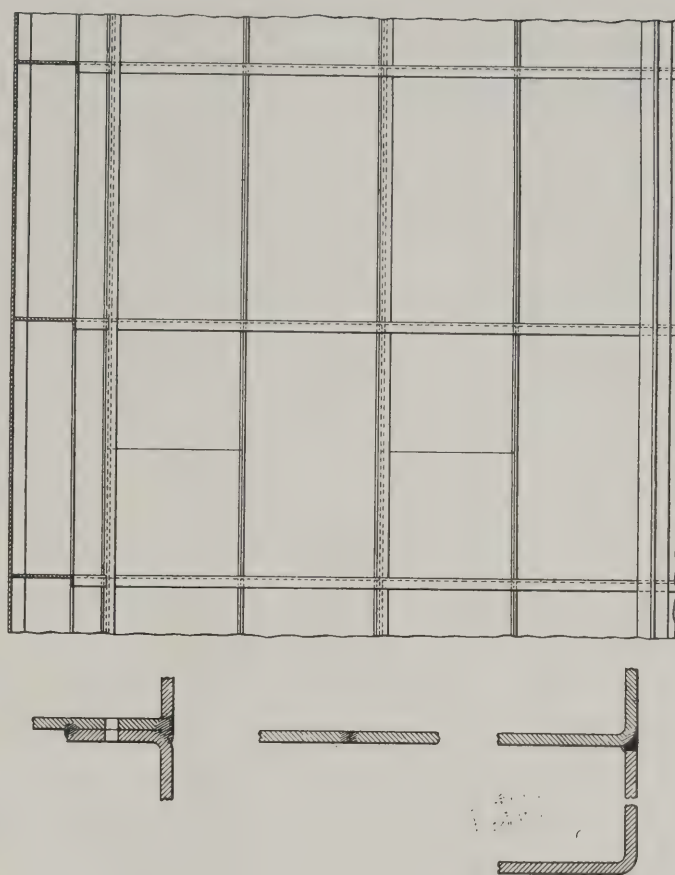


Fig. 80.—Top View of Bottom Construction, Ewertz Type of Electric Arc Welded Vessel

welded 225-ton barge described previously requires the equivalent of 9,000 feet of continuous welding of 5/16-inch plating. Of this amount 4,000 feet can be performed in the field under the best possible conditions, leaving 5,000 feet to be welded after erection. Basing the speed of welding on that obtained in building the cross channel barge AC-1320 we have an average of 7 feet per hour per operator on 5/16-inch plating which is very conservative. We have from the above, 1,286 operator hours of total welding time which at 60 cents per hour represents \$771.60.

For power and electrodes, accurate figures have been worked up by the Alloy Welding Processes, Ltd., using their flux covered electrode, which show that the cost for 5/16-inch plating is 8.2 cents per foot or \$738.

The total cost of welding, therefore, is \$1,509.60 or 16.8 cents per foot of welding.



Fig. 82.—Model of Ewertz 400-Ton Electric Arc Welded Barge

RIVETING vs WELDING COSTS

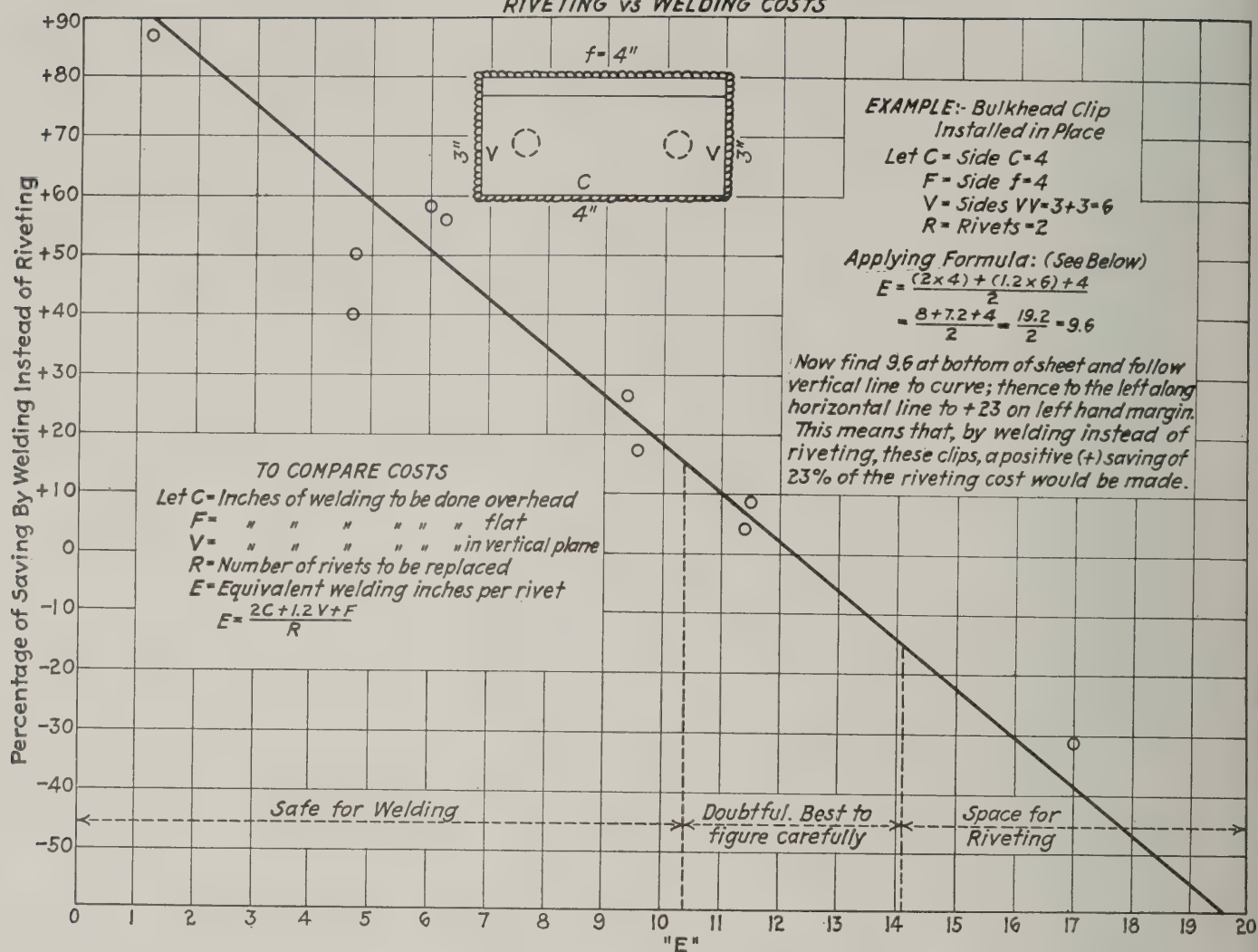


Fig. 83.—Chart Showing Percentages of Saving Between the Use of Riveting and Welding

Major Caldwell states that, from reliable figures of riveted construction, he estimates that single riveted lap joints for a barge of similar design would cost 48.6 cents per foot of joint.

Mr. H. Jasper Cox, in a paper read before the Society of Naval Architects and Marine Engineers in November, 1918, states that from certain data obtained by him in England, the results given in the following table, with quasi arc flux covered electrodes, are as follows:

Metal Electrode Arc Welding (Quasi Arc)

Plate thickness, inches	Power used per foot run, amps. at 100 V.	K. W. H. at 3 cents	Electrode per foot run in cents	Labor at 65 cents per hr.	Time per foot of weld	Speed in ft. per hr.	Total cost per ft. of weld in cents
1/8	55	.54c.	7.	2.165c.	2 m.	30	9.7
1/4	100	1.35c.	12.9	2.954c.	2 m. 45 s.	22	12.2
3/8	100	4.8c.	19.2	8.66c.	8 m.	7.5	32.66
1/2	120	7.2c.	25.5	13.00c.	12 m.	5	45.7

In this same paper, Mr. Cox reports figures prepared by the Electric Welding Committee of the Emergency Fleet Corporation.

The Possible Cost of a Fillet Weld on a 1/2-inch Plate, Using a Motor Generator Set and Bare Electrodes

Average speed of welding on continuous straightaway work 5 feet per hour
 Amount of metal deposited per running ft. 6 pounds
 Current 150 amperes at 20 volts and 3 kilowatts.
 Motor generator eff. 50 percent—

6 K. W. ÷ 5, equals..... 1.2 K.W.H. per 1 ft. run

1.2 K. W. H. @ 3c per K. W. H. equals 3.6 cents per foot
 Cost of electrode 10 cents per pound,
 and allowing for waste ends, etc., equals 7.2 cents per foot
 Labor at 65c. per hour, equals..... 13.00 per foot

23.8 per foot

The most complete cost data for electric arc welding was compiled at the Fore River Plant of the Bethlehem Shipbuilding Corporation at Quincy, Mass., under the supervision of Mr. W. S. Wakeman, general manager. Tables 1 to 10 give the cost on various items for both riveting and welding and Table 11 shows the summary of these various jobs. On Fig. 83, the percentage of saving is shown by a curve, and direct comparison is made between the use of welding and that of riveting.

Tables 12 to 24 inclusive (to be published in the next issue) show in tabulated form the time required to weld seams and holes. Great care was taken in making up these various tables and the results were checked from work.

Both the General Electric Company and the Lincoln Electric Company welding machines were used and in all cases, welding was made with bare electrodes.

TABLE 1.—98 Cargo Batten Clips, 14 inches overhead and 6 inches of flat weld against 2 rivets

	Welding	Direct Cost	Overhead Cost
Ship fitting.....		\$16.00	\$ 8.64
Welding (70 pay hours).....		57.40	31.57

	Direct Cost	Overhead Cost
Welding wire	8.00	.....
Welding current	6.00	.....
Total cost for welding	\$87.40	\$40.21
Unit cost for welding .....	.....	127.61
		1.30

Riveting

Marking and punching clips in shop	4.90	5.73
Laying out work on longitudinals	9.60	5.18
Drilling longitudinals	4.12	2.22
Electricity for drilling	.49	.....
Ship fitting	6.40	3.46
Bolting and reaming	22.54	12.17
Riveting	11.76	6.35
Air for riveting	1.08	.....
Rivets	1.32	.....

Total cost for riveting	\$69.21	\$35.11
Unit cost for riveting .....	.....	97.32
		.99
Total difference favor riveting .....	.....	30.29
Unit difference favor riveting .....	.....	.30

TABLE 2.—Twenty Large Awning Pads, 18 inches of welding against 2 rivets

Riveting

Marking pads for drilling	\$.67	\$.78
Drilling	.96	.52
Countersinking holes in pads	.40	.22
Laying out holes on boat	5.76	3.11
Drilling holes in deck	.96	.96
Fitting pads	4.40	2.37
Bolting and reaming	4.35	2.35
Riveting	4.00	2.16
Calking	6.00	3.24
Air	1.20	.....
Electricity	.15	.....
Rivets	.40	.....

Total cost of riveted pads	\$29.25	\$15.71
Unit cost of riveted pads .....	.....	44.96
		2.25

Welding

Welding (10 pay hours)	\$8.20	\$4.51
Fitting	4.40	2.37
Wire	1.33	.....
Electricity	1.00	.....

Total cost of welded pads	\$14.93	\$6.88
Unit cost of welding .....	.....	21.81
Total difference favor welding .....	.....	1.09
Unit difference favor welding .....	.....	23.15
		1.16

TABLE 3.—115 Vertical-Foot Hand Rail Stanchions, 16 inches of welding against 2 rivets

Riveting

	Direct Cost	Overhead Cost
Making holes on stanchions for drilling	\$3.83	\$4.48
Drilling holes in stanchion feet	5.52	2.98
Countersinking holes in stanchion feet	2.30	1.24
Laying out holes on boat	15.30	8.26
Drilling holes in gunwale and bridge	5.52	2.98
Fitting stanchions	15.81	8.54
Bolting and reaming	24.94	13.47
Riveting	11.50	6.20
Air	6.90	.....
Electricity	.86	.....
Rivets	2.30	.....

Total Cost Riveting	\$94.78	\$48.15
Unit Cost Riveting .....	.....	142.93
		1.24

Welding

Fitting	\$15.81	\$8.54
Welding (70 pay hours)	61.50	33.80
Wire	10.32	.....
Current	7.75	.....

Total Cost Welding	\$95.38	\$42.34
Unit Cost Welding .....	.....	137.72
		1.20
Total Difference favor welding .....	.....	5.21
Unit Difference favor welding .....	.....	.04

TABLE 4.—48 Triangular-Based Hand Rail Stanchions, 18-inch flat welding against 3 rivets

Riveting

	Direct Cost	Overhead Cost
Marking stanchions for drilling	\$2.40	\$2.81
Drilling holes in stanchions	3.46	1.87
Countersinking	1.44	.77
Laying out holes on deck	9.60	5.18
Drilling deck	3.46	1.87
Fitting stanchions	6.60	3.56
Bolting and reaming	26.32	14.21
Riveting	14.40	7.71
Air	4.32	.....
Electricity	.54	.....
Rivets	1.44	.....

Total cost of riveting	\$88.38	\$37.98
Unit cost of riveting .....	.....	126.36
		2.63

Welding

Fitting	\$6.60	\$3.56
Welding (30 pay hours)	24.60	13.28
Welding wire	5.00	.....
Electricity	3.75	.....

Total cost of welding	\$39.95	\$16.84
Unit cost of welding .....	.....	\$56.79
Total difference favor welding .....	.....	1.18
Unit difference favor welding .....	.....	69.57
		1.45

TABLE 5.—Twenty-four Small Awning Pads, 9½ inches of welding against 2 rivets

Riveting

	Direct Cost	Overhead Cost
Marking pads for drilling	\$0.80	\$0.94
Drilling	1.01	.55
Countersinking holes in pads	.48	.26
Laying out holes on deck	6.91	3.75
Drilling holes in deck	1.01	.55
Fitting pads	5.28	2.84
Bolting and reaming	3.48	1.88
Riveting	4.80	2.59
Calking	3.60	1.94
Air	1.00	.....
Electricity	.16	.....
Rivets	.32	.....

Total cost of riveting	\$28.85	\$15.28
Unit cost of riveting .....	.....	44.13
		1.84

Welding

Fitting	\$5.28	\$2.84
Welding	7.38	4.00
Wire	.60	.....
Electricity	.45	.....

Total cost of welded pads	\$13.71	\$6.90
Unit cost of welded pads .....	.....	20.61
Total difference favor of welding .....	.....	.86
Unit difference favor of welding .....	.....	23.52
		.98

TABLE 6.—57 Pipe Supports in Fire Water Line, 8 inches of welding against 2 rivets

Riveting

	Direct Cost	Overhead Cost
Marking and punching holes in hangers ..	\$3.26	\$3.82
Drilling holes in deck	2.40	1.30
Fitting	28.64	15.47
Bolting and reaming	9.04	4.88
Riveting (57)	5.70	3.08
Tapping 57 holes	5.24	2.83
Calking (horizontal feet)	8.55	4.62
Chipping and calking tap rivets	3.99	2.15
Electricity	.75	.....
Air	6.48	.....
Tap rivets	4.35	.....
Rivets	.40	.....

Total cost of riveting	\$79.65	\$38.61
Unit cost of riveting .....	.....	118.26
		2.08

	Direct Cost	Overhead Cost
Welding		
Fitting	\$28.64	\$15.47
Welding	15.58	8.40
Wire	1.40	.....
Electricity	1.17	.....
	<u>\$46.79</u>	<u>\$23.87</u>
Total cost for welding.....		70.66
Unit cost for welding.....		1.24
Total difference favor welding.....		47.60
Unit difference favor welding.....		1.51

TABLE 7.—Twenty-four Pump Room Grating Clips, 17 inches of welding against 2 rivets

	Direct Cost	Overhead Cost
Riveting		
Marking and punching clips.....	\$2.45	\$2.86
Laying out holes on boat and fitting.....	6.00	3.24
Drilling holes in bulkheads.....	2.45	1.32
Bolting and reaming.....	7.25	3.92
Riveting	4.80	2.59
Calking	2.21	1.19
Rivets	.32	.....
Electricity	.22	.....
Air	1.95	.....
	<u>\$27.65</u>	<u>\$15.12</u>
Total cost of riveting.....		42.77
Unit cost of riveting.....		1.78

Welding		
Fitting	\$6.00	\$3.24
Welding	14.76	8.11
Wire	1.92	.....
Electricity	1.44	.....
	<u>\$24.12</u>	<u>\$11.35</u>
Total cost of welding.....		35.47
Unit cost of welding.....		1.48
Total difference favor welding.....		7.30
Unit difference favor welding.....		.30

TABLE 8.—Six Pump Room Pipe Hangers, 36 inches welding against 4 rivets

	Direct Cost	Overhead Cost
Riveting		
Marking and punching clips in shop.....	\$0.74	\$0.82
Laying out holes on boat and fitting.....	1.50	.81
Drilling holes on boat.....	.74	.40
Bolting and reaming.....	1.90	1.03
Riveting	2.40	1.30
Calking	1.17	.63
Rivets	.16	.....
Electricity	.12	.....
Air	.98	.....
	<u>\$9.71</u>	<u>\$4.99</u>
Total cost of riveting.....		14.70
Unit cost of riveting.....		2.45
Welding		
Fitting	\$1.50	\$0.81
Welding	6.15	3.38
Wire	.80	.....
Electricity	.60	.....
	<u>\$9.05</u>	<u>\$4.19</u>
Total cost of welding.....		13.24
Unit cost of welding.....		2.21

Total saving by welding.....	Direct Cost	Overhead Cost
Unit saving by welding.....		1.46
		.24

TABLE 9.—92 Fuel Transfer and Drain Pipe Supports, 12 inches welding against 2 rivets

	Direct Cost	Overhead Cost
Riveting		
Marking and punching holes in hangers..	\$5.26	\$6.16
Drilling holes in deck.....	3.88	2.10
Fitting	46.30	24.96
Bolting and reaming.....	14.58	7.86
Riveting	9.20	4.98
Tapping 92 holes.....	8.45	4.56
Putting in 92 tap rivets.....	1.37	.74
Calking	13.80	7.46
Chipping and calking tap rivets.....	6.44	3.47
Electricity	1.41	.....
Tap rivets	7.02	.....
Air	10.45	.....
Rivets	.65	.....
	<u>\$128.81</u>	<u>\$62.29</u>
Total cost for riveting.....		191.10
Unit cost for riveting.....		2.08
Welding		
Fitting	\$46.23	\$24.96
Welding	39.61	21.90
Wire	5.15	.....
Electricity	3.86	.....
	<u>\$94.85</u>	<u>\$46.86</u>
Total cost for welding.....		141.71
Unit cost for welding.....		1.54
Total difference favor welding.....		49.39
Unit difference favor welding.....		.54

TABLE 10.—Fifty Bounding Angle Bosom Pieces, 6 inches welding against 12 rivets—3 inches by 3 inches by 18 inches by 3/8 inch

	Direct Cost	Overhead Cost
Riveting		
Marking and punching bosom pieces in shop	\$11.38	\$13.31
Marking and punching bars in shop.....	.88	1.03
Fitting	17.50	9.45
Bolting and reaming.....	108.00	58.32
Riveting	24.00	12.96
Calking	17.00	9.17
Material	16.00	.....
Air	13.60	.....
Electricity	8.45	.....
Rivets	8.00	.....
	<u>\$224.81</u>	<u>\$104.24</u>
Total cost for riveting.....		329.05
Unit cost for riveting.....		6.58
Welding		
Chipping	\$5.00	\$2.70
200 rivets in place.....	15.80	8.53
Welding (25 pay hours).....	20.50	.....
Electricity	3.38	.....
Wire	4.50	.....
	<u>\$49.18</u>	<u>\$22.50</u>
Total cost welding.....		71.68
Unit cost welding.....		1.43
Total saving by welding.....		257.37
Unit saving by welding.....		5.15

TABLE 11.—Summary

Name of Fitting	Number Pieces	Rivets Per Piece	Inches of Welding Per Rivet	Total Riveting Cost	Total Welding Cost	Unit Riveting Cost	Unit Welding Cost	Saving by Welding Per Piece	
Cargo batten clips.....	98	2	10	\$97.32	\$127.61	\$0.99	\$1.30	\$0.31	—31
Large awning pads.....	20	2	9	44.96	21.81	2.25	1.09	1.16	51.5
Small awning pads.....	24	2	4.75	44.13	20.61	1.83	.86	.97	53
Triangular hand rail stanchions.....	48	3	6	126.36	56.79	2.63	1.18	1.45	55
Vertical hand rail stanchions	115	2	9	142.93	137.72	1.24	1.19	.05	4
Pipe hangers—F. W. line.....	57	2	4	118.26	70.66	2.08	1.24	.84	40.4
Pipe hangers, drain and fuel.....	92	2	8	191.10	141.71	2.08	1.54	.54	26
Clips—pump room, pipe hangers.....	6	4	9	14.70	13.24	2.45	2.21	.24	9.8
Clips, pump room gratings.....	24	2	8.5	42.77	35.47	1.78	1.48	.30	17
Bounding angle butts.....	50	..	..	329.05	71.68	6.58	1.43	5.15	78

(To be continued)

Protective Coverings for Shipbuilding Purposes: Paints

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

WE have dealt with the principal paints whose services in the marine field require the particular consideration of factors which are of little or no importance on land; and as we are not concerned with the uses of paints in general, the pertinency of the above explanatory note will be particularly apparent in this article.

Some proprietary paints are very good for the services for which they are proposed, but others are poor, and the temptation to adulterate paints in order to meet price competition is hard to resist. The formulæ here given will serve as a guide to good practice.

EXTERIOR PAINTS, GENERAL

The standard paint for a vessel's topsides and other exterior work when white or gray is a white lead and linseed oil paint, which can be tinted as required. A trace of ultramarine added to the paint brings out a clear white color, and the addition of carbon black will produce any desired shade of gray. Considerable amounts of white zinc can be used in place of the white lead with good results. At least two coats should be applied over a priming coat, and three coats should be used on woodwork.

Specifications for this paint adopted in 1917 by the United States Shipping Board Emergency Fleet Corporation are as follows:

Zinc oxide—not less than 25 percent nor more than 50 percent. The remainder may be either basic sulphate white lead or basic carbonate white lead, or a combination of the two.

If desired, there may be substituted for a part of the lead pigments either magnesium silicate, silica, barium sulphate, or calcium carbonate, or a mixture of these pigments, in amounts not aggregating more than 15 percent of the total pigment. In any event the pigment portion of the paint shall contain not less than 15 percent of total lead and zinc pigment.

The vehicle shall consist of pure linseed oil, liquid drier and volatile thinner, which may be either turpentine or mineral spirits, or a mixture of these, no rosin shall be present. The total volatile thinner, including that contained in the liquid drier, shall not exceed 10 percent of the total vehicle.

The paint shall contain not less than 64 percent by weight of pigment and weigh not less than 15¼ pounds per gallon. The paint must be satisfactory in every respect including body and freedom from objectionable settling or caking in can. The paint must have satisfactory working qualities, hiding power, drying, color, gloss and durability.

The United States Navy formula No. 6 "outside white," which weighs about 17 pounds 4 ounces per gallon, is along somewhat similar lines, but is called for only as a final coat. Other coats are their "inside white" formula No. 27 which will be referred to later. Formula No. 6 is as follows:

	1 Gallon
White lead, in oil	5 pounds
Zinc oxide, in oil	9 pounds
Raw linseed oil	3 pints
Mineral spirits	3 gills
Drier	2 gills
Ultramarine blue	1/12 ounce

Specifications for white paint for exterior use adopted in

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

1918 by the War Service Committee of the Paint Industry are:

Pigment	62 percent
Liquid	38 percent
The pigment portion shall consist of—	
White lead (basic carbonate, basic sulphate, or a mixture thereof)	45 percent
Zinc oxide	35 percent
Aluminum silicate, magnesium silicate, or a mixture thereof	20 percent
The liquid portion shall consist of—	
Raw linseed oil	75 percent
Varnish	10 percent
Drier	5 percent
Turpentine	5 percent
Volatile mineral spirits	5 percent

A trace of ultramarine blue may be added to make a clear white, which is the color desired.

Special requirement: The paint shall weigh not less than 15¼ pounds per gallon.

Where the topsides are black the pigment is carbon black and the United States Navy formula No. 13 for this paint is:

	1 Gallon
Lampblack, in oil	3 pounds 12 ounces
Raw linseed oil	3 pints 1 gill
Mineral spirits	3 gills
Drier	3½ gills

This paint weighs about 8 pounds per gallon.

The topsides and other exterior surfaces of a large number of steel and wood vessels have been coated with black paints which conform to the following specifications, which appear to allow an undesirable amount of pigment adulterant and of thinner and drier. The writer has no data as to how these paints stand up as compared with the United States Navy paint:

Pigment	15 percent
Liquid	85 percent
The pigment portion shall consist of:	
Carbon black	50 percent
Shale black, aluminum silicate, magnesium silicate or mixture thereof	50 percent
The liquid portion shall consist of:	
Pure linseed oil	40 percent
Pure China wood oil	10 percent
The balance shall be combined drier and thinner.	
The thinner shall be turpentine or volatile mineral spirits or mixture thereof.	

The paint shall weigh not less than 8 pounds per gallon and shall dry within 18 hours after application to a full oil gloss. The carbon black used in the manufacture of this paint must be a good quality, free of grit, shall not contain more than 1 percent of ash and shall be the perfectly calcined product from gas.

All percentages are to be figured by weight.

For spar or spruce color paint, which is used considerably about a vessel, an extensively used formula is about as follows:

	1 Gallon
White lead in oil	14.0 pounds
Yellow ochre in oil	1.4 pounds
Venetian red in oil	.9 ounce
Raw linseed oil	3.0 pints
Mineral spirits	3.6 gills
Drier	1.5 gills

This agrees closely with the United States Navy formula No. 7 for spar color paint, which has a specified weight of 18 pounds 11 ounces per gallon.

Steel decks are preferably protected with two coats of red lead priming paint. Any other paint that may be required is preferably of an abrasive resisting nature such as the boottopping paint referred to in the September issue of this magazine.

INTERIOR PAINTS, GENERAL

When selecting paints for the holds and tween decks of steel ships care should be taken not to have paints that will make the spaces too dark or that will be too light to wear well. Black paints are not desirable for this reason. Gray paints are good for the underside of decks but are not usually desirable elsewhere in cargo spaces. Apart from this feature any good priming paint makes a good hold paint, and in fact some oxide of iron paints that are not desirable as priming paints make very good hold paints for second and third coats. Some proprietary hold paints are the anti-corrosive bottom compositions under another name, and they also give good service as second and third coats on interior steelwork. There are some proprietary paints to which other paints will not adhere but which have excellent anti-corrosive and wear resistant properties; and these also find a good field in holds and similar spaces.

As previously stated, the interior surfaces of wood hulls should not be painted with an oil paint, because the paint plugs up the pores of the wood, and will bring about dry rot, if the wood has not been thoroughly seasoned.

The best pigments for interior paint for accommodations are white lead and white zinc and the best vehicle is linseed oil. The following schedule typifies high grade merchant ship practice for first class accommodations and similar spaces:

- 1 coat of shellac
- 1 thin coat of white priming paint with a vehicle about 40 percent linseed oil and 60 percent turpentine
- 1 white coat of shellac
- 2 coats of linseed oil paint with pigment 60 percent white lead and 40 percent zinc oxide
- 1 coat straight zinc oxide and linseed oil paint
- 1 coat of enamel

For corresponding spaces on government vessels where white the Navy Department requires

- 1 priming coat
- 2 coats of inside white, formula 27
- 1 coat of flat white, formula 29
- 1 coat of white enamel, formula 30

The formulæ for the white paints are as follows:

Quantities Required for 1 Gallon			
	Inside White	Flat White	White Enamel
White lead, in oil...	7 pounds		
Zinc oxide, in oil...	7 pounds (American)	15 pounds 4 ounces	4 pounds (French)
Raw linseed oil	7½ gills		
Mineral spirits	8 1/6 gills	3 pints	
Drier	1½ gills	¾ gill	
Ultramarine blue, in oil	1/12 ounce	2/25 ounce	1/25 ounce
Damar varnish		½ gill	7 pints
Weight per gallon	18 pounds	17 pounds 8 ounces	11 1/16 lbs.

Specifications for flat white and white enamel adopted in 1918 by the War Service Committee of the Paint Industry are:

FLAT WHITE

Pigment	70 percent
Liquid	30 percent

The pigment portion shall consist of—

Lithopone (containing not less than 26 percent zinc sulphide)	80 percent
Zinc oxide	10 percent
White crystalline pigments	10 percent

The liquid portion shall consist of—

Treated oils and volatiles, or varnishes which produce a satisfactory washable flat finish.

The liquid portion shall contain—

Non-volatiles (not less than)	20 percent
Volatiles (not more than)	80 percent

The volatiles shall be turpentine, or volatile mineral spirits or a mixture thereof. Of the total volatiles not more than 2½ percent may be water.

Special requirements: The physical characteristics particularly required are fineness, flowing and flattening. The paint shall weigh not less than 14½ pounds per gallon.

WHITE ENAMEL

The pigment shall consist wholly of—

Pure French process zinc oxide.

The liquid shall consist of—

High-grade varnish resins or treated oils, with such volatiles as are necessary.

It shall not contain more than 1 percent of moisture in any form.

Special requirements: This enamel shall be clear white and dry with a high lustre, to a tough elastic film, within 12 hours. When brushed onto a panel of clean bright tin and allowed to dry for 48 hours, it shall withstand bending over a rod ⅛ inch in diameter without showing cracking or flaking at the point of bending.

Interior paints are the ones in which there is the greatest cutting of values in order to cut prices. Lithopone is used in cheap paints in place of white lead or white zinc and, where the color will allow, domestic oxides and other earth pigments are used. The linseed oil is reduced by extending it with other liquids, some of which are claimed to make the colors more permanent, and the paint, less affected by moisture.

Some proprietary so-called white leads are over 25 percent barium sulphate, which is nothing but a cheap adulterant. Barium sulphate, silica, asbestos or other cheap white mineral adulterants are usually not objectionable up to about 15 percent of the total pigment, as allowed in the United States Shipping Board outside white paint, provided their presence is understood. The chief objection to their use is that they are not opaque when mixed in an oil vehicle, and they reduce the hiding power of the paint.

There are on the market a number of special paints and systems of painting for interiors and a few of them have given very good results in marine service as well as on land. Their merits cannot very well be gone into here, but when anything of the kind is offered the proposers should be asked to show the results of actual service.

PAINTS FOR SPECIAL SERVICES

Cork Paint.—For cork painting the coat next to the priming paint has to be a thick coat of a nature to which the cork will adhere well. Subsequent coats are preferably the same as on adjacent surfaces. The Navy Formula No. 51 for the coat directly under the cork is

	1 Gallon
Whiting	7 pounds 5½ ounces
Interior varnish	5 pints 1 gill
Raw linseed oil	1 gill
Drier	1 gill
Weight per gallon	12 pounds 5 ounces

The grains of cork should pass through a No. 8 sieve but be large enough to be held on a No. 12 sieve.

Paint Under Doublings.—This paint is also of a special nature with good body and waterproofing qualities, and there are proprietary paints on the market for this service.

Seam Cement.—Some of these proprietary compositions offered for both steel and wood ships are of the nature of paints and are preferable to ordinary paints for filling in calking seams, cracks and abrasions on wood ships.

Stack Paint.—Paint for stacks and other particularly hot surfaces is preferably of a special nature and usually contains litharge. Proprietary paints for this service are on

the market, and the Navy Department has the following formulæ for spar color and light gray stack paints, Nos. 8 and 10 respectively:

No. 8		1 Gallon
Silica, dry	2 pounds	
White lead, in oil	6 pounds	
White lead, dry	6 pounds	
Yellow ochre, in oil	1 pound	4 ounces
Litharge	1 pound	4 ounces
Boiled oil	10 gills	
Mineral spirits	8 gills	
Venetian red, dry	1 ounce	
Weight per gallon	20 pounds	10 ounces

No. 10		1 Gallon
White lead, dry	4 pounds	13 ounces
Zinc oxide, dry	1 pound	14 ounces
Lampblack, dry	1½ ounces	
Litharge	5¾ ounces	
Kerosene	2 quarts	
Drier	2½ gills	
Damar varnish	1 quart	
Weight per gallon	13 pounds	

Waterproofing Canvas.—Special compounds of proved merit should be used for this service.

Canvas Preservative.—The Navy Department has a preservative compound for white canvas and a preservative light gray canvas paint of the following formulæ, No. 20 and No. 21 respectively:

	1 Gallon	
	No. 20	No. 21
Paraffine, crude (melting point 103-105 deg.)	1 pound 12 ounces	1 pound 12 ounces
Paraffine oil (specific gravity, 865)	4 gills	4 gills
Mineral spirits	10 gills	10 gills
Kerosene	10 gills	10 gills
Zinc oxide, dry	7 ounces	7 ounces
Lampblack	7/10 ounce	7/10 ounce
Weight per gallon	7 pounds 14 ounces	8 pounds 3 ounces

Machinery.—Paint for main engines and auxiliaries, ice machines and other inside machinery is preferably a varnish vehicle paint.

Inside of Water Tanks.—Many special compounds are available for this purpose. One of these, of the nature of a thin bodied varnish, has shown up well in combination with Portland cement. Another, which is a rubber composition applied hot, has given good results. Bituminous compositions are good for this service. The Navy Department requirements for the washing out of fresh water tanks which have been coated with bituminous solution and enamel have been stated in the June, 1923, issue of this magazine.

Inside of Boilers.—Coatings for the water and steam surfaces of firetube boilers are on the market in considerable numbers but their merits should be carefully investigated. Some of them are used and recommended by the engine room personnel after satisfactory trial. One chief engineer will swear by a cement wash made up of Portland cement and fresh water only. Another will not tolerate cement in his boilers and considers a coating of metallic zinc powder mixed up in clean fresh water to be the only thing. Another has obtained such good results with white zinc mixed up in kerosene oil that he will not use anything else. Another uses a mixture of cement and lime, half and half, in hot water, about the consistency of white wash, with a handful of tallow to the bucketful to keep them in suspension.

VARNISH

A good specification for spar varnish, the principal varnish required on shipboard, was given in the first section of this article appearing in the July issue. There are, however, a number of good proprietary varnishes on the market of which Valspar is generally conceded to be the best. Lists of approved spar varnishes will often include the following:

Valspar	Valentine & Company
Wood oil coating No. 1	Glidden Varnish Company
Aero Rex spar	Sherwin-Williams Company
Spar varnish	Colonial Works
Spar varnish	Howe Varnish Company

Damar varnish is used in paints for inside work and the Navy Department specifications for this varnish embody the following requirements:

COMPOSITION

The varnish shall consist exclusively of a solution of pure damar resin in petroleum spirits (turpentine substitute), and be absolutely free from all foreign matter. It shall contain not less than 55 percent nor more than 60 percent by volume of petroleum spirits.

PHYSICAL CHARACTERISTICS

The varnish when poured on a dry glass plate held in a position inclined 30 degrees to the vertical shall set to touch in not more than 30 minutes. It shall not flash below 105 degrees F., when tested in an open tester by Tagliabue's method.

COMPARISON WITH STANDARD SAMPLES

The varnish shall be equal to the standard sample on hand at the various navy yards, in body, clearness, lightness of and freedom from color; and when mixed with French white zinc: in flowing qualities, covering properties, gloss, finish, and durability.

Mixing varnish called for by the Navy Department in its formulæ for boottopping paints has the following specification requirements:

QUALITY

Mixing varnish shall be made of high-grade material, of good manufacture, and free from any ingredients which may affect its suitability as a mixing varnish for boottopping paint.

PHYSICAL PROPERTIES

The varnish shall be clear and free from sediment or suspended matter. When flowed on glass plate placed at 30 degrees to the vertical the material shall not come off when touched lightly with the finger after two hours, and shall dry elastic in from 12 to 16 hours at a temperature between 60 degrees and 80 degrees F. The varnish shall mix readily with the pigment and remain in solution when mixed. When tested in an open tester by the method known commercially as "Tagliabue's method" it shall not flash below 100 degrees F. When mixed and ground as per the following formula—for one gallon—

Mixing varnish	2 pints
Drier	2 pints
Petroleum spirits	2¾ pints
Lampblack, in oil	31½ ounces
White zinc, American, dry	30 ounces

the boottopping paint shall in service retain its color and body and shall not flake or peel off due to the alternate action of the water and air. When applied to the steel plating the boottopping paint shall dry sufficiently within 4 hours to permit of the application of a second coat.

GENERAL COMPOSITION

The base of the mixing varnish shall be either china wood oil or linseed oil, or both, and varnish resins or such other ingredients as may be deemed essential by the manufacturer to produce a mixing varnish complying with the requirements of paragraph 3 (just above.)

ACCEPTABLE BRANDS OF MIXING VARNISH

Bids for mixing varnish will be considered from only those manufacturers whose mixing varnish has been found, after service tests, to be satisfactory for the purpose, and the department reserves the right to reject any bids based on varnishes which are unknown or have not been subjected to the required service tests.

Varnish for inside bright finish work goes by the name of interior varnish, and Navy Department requirements for it are a good guide for the selection of varnishes that may be expected to give good results. They are as follows:

MATERIALS

The manufacturer is given wide latitude in the selection of raw materials and processes of manufacture, so that he may produce a varnish of the highest quality.

GENERAL REQUIREMENTS

(a) The varnish shall be suitable for general interior use, including both rubbed and unrubbed finish, exclusive of floors. It must be capable of easy application with a brush in the ordinary manner, according to the rules of good standard practice, must flow out to a good level coat, free from runs, sags, pits, or other defects, and dry with reasonable promptness to a hard, somewhat elastic glossy coating which can be rubbed in 48 hours or less.

(b) The varnish shall be clear and transparent and not darker in color than a solution of 3 grams of potassium dichromate in 100 cubic centimeters of pure sulphuric acid, specific gravity 1.84.

(c) It shall have a flash point (closed-cup) of not below 32.2 degrees C. (90 degrees F.) and shall contain, by weight, not less than 45 percent of non-volatile matter.

(d) The varnish shall set to touch in not more than 4 hours, dry hard in not more than 24 hours, and dry to rub in not more than 48 hours, under standard conditions of temperature and humidity.

(e) The film on metal shall stand rapid bending over a rod 3 millimeters ($\frac{1}{8}$ inch) in diameter.

(f) The varnish shall have good brushing, flowing, covering, leveling, and rubbing properties, and shall show no impairment of lustre or other defect when used where natural or illuminating gases are burned or when subjected to air currents during the process of drying or application.

(g) The dried film shall stand application of cold water for not less than 18 hours without whitening or showing other visible defects.

TESTS

(a) Deliveries will, in general, be sampled and tested by the following methods, but the Department reserves the right to use any additional available information to ascertain whether the material meets the specifications.

(b) It is mutually agreed by buyer and seller that a single package, out of each lot of not more than 100 packages, be taken as representative of the whole. Whenever possible, an original unopened container shall be sent to the laboratory, and when for any reason this is not done the inspector shall thoroughly mix the contents of the container sampled, transfer not less than 1 quart to a clean dry glass bottle or tin can which must be nearly filled with the sample, securely stoppered with a new clean cork or well-fitting cover or cap, sealed, and distinctly labeled by the inspector.

(c) The inspector should take a duplicate from the container sampled, to be held for check in case of dispute, and, when requested, should take a sample for the seller.

(d) The tin panels used in the following tests shall be cut from bright tin plate weighing not more than 25 grams nor less than 19 grams per square decimeter (0.51 to 0.39 pound per square foot). (Bright tin plate, 0.0109375 inch, should weigh about 0.44 pound per square foot. It is important that the tin plate used shall be within the limits set.)

(1) *Appearance*.—Pour some of the thoroughly mixed sample into a clear glass bottle or test tube and examine by transmitted light. The varnish must be clear and transparent.

(2) *Color*.—Prepare a standard color solution by dissolving 3 grams of pure powdered potassium dichromate in 100 cubic centimeters of pure concentrated sulphuric acid of specific gravity 1.84. Gentle heat may be used, if necessary, to perfect the solution of the dichromate. The standard color solution and a sample of the varnish to be tested shall be placed in clear, thin-walled glass tubes of the same diameter. The color comparison shall be made by placing the tubes close together and looking through them by transmitted light. The tubes used for this test should be 1.5 to 2.0 centimeters ($\frac{5}{8}$ to $\frac{13}{16}$ inch) in diameter and shall be filled to a depth of at least 2.5 centimeters (1 inch). (Since the potassium dichromate-sulphuric acid must be freshly made for this color comparison, it is frequently more convenient to compare samples with a permanently sealed tube of varnish which has previously been found to be slightly lighter in color than the standard solution of 3 grams dichromate in sulphuric acid. When samples are found to be darker than this standard tube of varnish, the dichromate standard should be made up for final decision.)

(3) *Flash Point*.—Determine with either the "Tag" or Elliott closed-cup tester. The former is preferred.

(4) *Nonvolatile matter*.—Place a portion of the sample in a stoppered bottle or weighing pipette. Weigh container and sample. Transfer about 1.5 grams of the sample to a weighted flat-bottomed metal dish about 8 centimeters (3.1496 inches) diameter (a friction-top can plug). Weigh container again and by difference calculate the exact weight of the portion of sample transferred to the weighed dish. Heat dish and contents in an oven maintained at 105 degrees to 110 degrees C. (221 to 230 degrees F.) for three hours. Cool and weigh. From the weight of the residue left in the dish and weight of the sample taken, calculate the percentage of nonvolatile residue.

(5) *Drying time*.—Pour the varnish on a clean glass or bright tin plate not less than 15 centimeters (6 inches) long and 10 centimeters (4 inches) wide. Place the plate in a nearly vertical position in a well-ventilated room, but not in the direct rays of the sun. The temperature of the room should be from 21 to 32 degrees C. (70 to 90 degrees F.). In cases of rejections on drying time, standard conditions of temperature and humidity shall be 70 degrees and 65 percent, respectively. The setting and drying time specified shall be obtainable under these conditions. The film is tested at points not less than 2.5 centimeters (1 inch) from the edges of the film by touching lightly with the finger. The varnish is considered to have set to touch when gentle pressure of the finger shows a tacky condition, but none of the varnish adheres to the finger. The varnish is considered to have dried hard when the pressure that can be exerted between the thumb and finger does not move the film or leave a mark which remains noticeable after the spot is lightly polished. If rapid light rubbing breaks the surface, the sample is considered not to have satisfactorily dried hard. In case the test shows time of setting to touch or drying hard more than 4 and 24 hours, respectively, two additional tests shall be run on different days, and if the varnish does not meet the above drying and hardening requirements on both of these additional tests, it shall be considered unsatisfactory.

(6) *Toughness*.—Thoroughly clean, with benzol, a sheet of bright tin 7.5 by 13 centimeters (about 3 by 5 inches). Flow the varnish on one side of the tin plate and set in a vertical position in a well-ventilated room, not in the direct rays of the sun, at a temperature not below 21 degrees C. (70 degrees F.).

After the varnish on the tin plate has dried for 48 hours bring to a temperature between 21 and 24 degrees C. (70 to 75 degrees F.), and with the varnish film on the outside bend rapidly over a rod 3 millimeters ($\frac{1}{8}$ inch) in diameter. The film must show no evidence of cracking or flaking.

(7) *Water resistance*.—Prepare a panel as in (6) and let it dry in a well-ventilated room for 48 hours. Place the panel in a beaker containing about 2.5 inches of distilled water at room temperature (immersing the end of the panel which was uppermost during the drying period) and leave in water for 18 hours. The varnish shall show no whitening and no more than a very slight dulling when observed after removing the panel from the water and drying for 2 hours.

(8) *Flowing and rubbing properties*.—Thoroughly clean, with benzol, a glass plate about 15 by 20 centimeters (6 by 8 inches). Flow the varnish so as to entirely cover one side of the panel and stand in a nearly vertical position with the long edge horizontal for 8 minutes. Then draw lightly a 25 millimeters (1 inch) section of a hard-rubber comb (having 8 to 10 teeth to the centimeter) horizontally across the varnish surface, first 2 centimeters (0.7874 inch) from the bottom and then 2 centimeters (0.7874 inch) from the top of the plate. Let panel stand in the same position for 20 minutes longer, then lay flat. An exaggerated condition of a dusty room shall be created by rubbing some cotton batting between the hands immediately over the panel. Let panel dry for a total of 48 hours in a well-ventilated room. If the comb marks show at this time, the varnish shall be rejected. If no comb marks show, the surface shall then be rubbed with pumice flour, water, and a felt pad with long, even, firm strokes back and forth in one or another direction, but not in circles, until every portion of the panel has been rubbed. Most of the pumice will then be removed from the pad and panel, and the varnish film given a "water rub" with the pad.

A satisfactory rubbing varnish in the above test will yield a smooth, dull film even at those places where the dust particles have been encrusted in the film, and shall show no spots where the pumice has been ground into and become attached to the film, nor show any other evidence of gumming. No sweating shall occur anywhere on the film in 18 hours after rubbing.

(9) *Gas test—Apparatus*.—The necessary apparatus consists of a glass bell jar approximately 20 centimeters (8 inches) in diameter and 30 centimeters (12 inches) in height, inside dimensions, having a ground-glass rim; a ground-glass base plate of suitable size; a small kerosene glowlamp without chimney or a small alcohol lamp filled with kerosene, using a round wick not over 6 millimeters ($\frac{1}{4}$ inch) in diameter and adjusted to give a flame 2 centimeters ($\frac{4}{5}$ inch) in height. A wire or a light wooden frame is fitted inside the jar and provided with a support for holding a disk of tin plate 15 centimeters (6 inches) in diameter in a horizontal position 5 centimeters (2 inches) above the wick of the lamp. The frame must also be provided with several other supports above this disk for holding in a horizontal position the various varnished panels under test. The test panels consist of semicircular pieces of bright tin plate approximately 15 centimeters (6 inches) in diameter.

The form and arrangement of the above apparatus is designed to provide an even distribution of the products of combustion over the test panels.

Method.—First determine the normal time required for the varnish under examination to set to touch at room temperature. Divide this time by 5 to arrive at the different drying periods at which the varnish is to be tested in the gas tester. Thus, if a varnish sets to touch in 5 hours, samples should be tested for resistance to gas at drying periods of 1, 2, 3, and 4 hours; it is needless to use the fifth or 5-hour period for the above varnish, as a varnish which has set to touch is practically immune to injury from gas fumes. Similarly a varnish which sets to touch in 1 hour should be tested for resistance to gas at drying periods of 12, 24, 36, and 48 minutes.

Example.—A varnish which sets to touch in 5 hours is tested as follows:

First, clean two of the semicircular, bright, tin-plate panels carefully with benzol. Flow the varnish on one-half of panel No. 1 at say, 10 A. M., and allow to drain in a nearly vertical position at room temperature. At 11 A. M. flow the varnish on the other half of panel No. 1; allow to drain as before. At 12 M. varnish one-half of panel No. 2 and at 1 P. M. varnish the other half as above. At 2 P. M. place the two panels close together in a horizontal position on the upper supports of the frame. Light the lamp and set it under the circular tin. Place the bell jar in position,

centering it as nearly as possible, properly seated on the ground-glass plate. If the chamber is tight and lamp properly adjusted, the flame will be extinguished in about 4 minutes. After the panels have been in the chamber for half an hour, remove the bell jar and examine the varnished panels for gas effects.

The varnish on all four sections should remain bright and clear without trace of pitting, "crow's footing," frosting, or other defects.

PACKING AND MARKING

(a) Varnish shall be delivered in 5-gallon or 1-gallon tin cans, as specified, packed 10 gallons per case.

(b) Five-gallon cans and cases for same shall be made in accordance with the latest issue of Navy Department Specifications for Five-Gallon Tin Cans and Shipping Cases.

(c) One-gallon cans and cases for same shall be made in accordance with the latest issue of Navy Department Specifications for One-Gallon Tin Cans and Shipping Cases.

(d) Each can shall be labeled with the name of the material, the quantity, and the name of the manufacturer.

(e) Cases shall be marked with the name of the material, the name of the contractor, and the contract or order number under which delivery is made.

(To be continued)

Insurance Cases Adjusted in Court Attract Attention

Unusual Circumstances Involved in Establishing Loss Claims

—London Underwriters Hard Hit—Lake Grain Situation

By "Bordereaux"

THE value of the *Proteus*, which was wrecked by collision with the *Cushing* on August 19, 1918, has been increased by \$500,000 and is now fixed at \$1,225,000 by authority of the United States Circuit Court of Appeals, Second Circuit, thus modifying the decree of the lower tribunal. The Southern Pacific owned the *Proteus*, and the Standard Oil the *Cushing* the former was a total loss, and the underwriters have paid on account of both hull and cargo. The cargo owners were represented in the appeal by Bigham, Englar and Jones. The action was of interest to them because additional recovery from the carrier is made possible by the increase in value.

The *Proteus* was insured under full form for \$600,000, half being placed in this market and half abroad. She was also insured 15 percent on disbursements, largely here.

London Underwriters Hit

LONDON underwriters will have a big loss to face in the case of the steamer *Ferrara*, practically destroyed by fire near Sabang. So far as can be gathered, a shipment of opium from Persian Gulf to Macao, insured on a value of about £200,000, has been destroyed. Practically the whole loss will fall on the London market. Another cause for anxiety was the stranding of the steamer *Magicstar*, one of the fleet owned by the Union Cold Storage Company, which ran ashore in the Yang-tze-kiang, after leaving Hankow, with nearly 4,000 tons of eggs in refrigeration. This cargo may be worth over £200,000. Up to 20 guineas was paid against the risk of total loss of the steamer, and 40 guineas against the risk of total loss of the cargo, but the rate dropped to 5 guineas on the hull before she was floated. The steamer was of 5,534 tons, and is insured on a value of £100,000. The owners run the risk of particular average, and also part of the total loss risk. The steamer *Cid*, which ran ashore on the south coast of the Straits of Gibraltar, near Cires Point, when bound from Spain to London, was quoted at 35 guineas against the risk of total loss, but was re-floated after the rate had dropped to 10 guineas. The

steamer was of 1,847 tons, and owned by the Macandrew Line, being insured on a value of £65,000.

Establishing Loss Claims

THE following case, decided in the English courts, in which an American company was involved, has attracted considerable attention in this country:

In the King's Bench Division on July 24, Mr. Justice Rowlatt delivered judgment in the case of Zachariessen v. Importers and Exporters Marine Insurance Company and others.

Plaintiffs insured with defendants a vessel carrying a cargo of coal from Newport News to Gothenburg "against mine risks only as per Norwegian conditions, including missing." The vessel left Newport News on October 1, 1920, and was never again heard of. Plaintiffs claimed for a loss under the policy contending that they could recover, if the ship was "missing" from any cause whatsoever, but defendants argued that they were only liable, if the vessel was missing by reason of damage caused by a mine.

Council for defendants submitted that the words "mines only" were words of definition and exclusion and limited the range of the insurance. The evidence showed that the vessel was already fully insured in Finland against ordinary marine risks, and there would be no need to take out this policy in relation to such ordinary risks. The intention clearly was that this policy should cover only the risk of mines. On the facts it was improbable that the ship was lost by anything but an ordinary peril of the seas. At that time there were several derelicts drifting about the Atlantic and, if this vessel had struck one of them in the dark, she would, with her heavy cargo of coal, almost certainly have sunk at once. To say that the ship was lost owing to striking a mine was mere conjecture, and that was not enough to make the underwriters liable. There must be a legitimate inference from the known facts.

In his judgment Mr. Justice Rowlatt said that the only point for decision was the construction of the words "mines

only, including missing." On the question of burden of proof there was really no difficulty or obscurity in principle. If a ship was no longer to be found afloat she must have sunk, and if it was desired to claim for a loss from some cause other than an ordinary peril of the sea, the claimant must prove a loss by that specific cause. The proof might be given by direct evidence, or it might be given by inferential evidence; and inferential evidence might be very strong. The contention of the plaintiffs was that the underwriters had agreed that, if the ship was missing and nothing further was known, it should be presumed in the plaintiff's favor that the loss was due to a mine. The contention of the defendants was that there must be inferential evidence of a loss by mine before the defendants could be liable. On the whole, he thought that the contention of the plaintiffs was right; the underwriters, in effect, agreed that, if the ship was missing and if nothing else was known, it should be presumed that the loss was attributable to a mine. There must therefore be judgment for the plaintiffs. On the facts, he could not agree with the plaintiffs that there was anything to show that the loss was due to a mine; there was really no evidence from which that could be inferred, and it was a mere guess.

Lake Grain Situation

ONE of the subjects to which New York marine underwriters have given most attention this summer has been that of the lake grain situation. An important special meeting was held in the Board Room of the Board of Underwriters of New York for the purpose of considering the effect upon the American marine market of the recent legislative action of the Canadian Parliament with respect to vessel charterers. Charles R. Page, of the Fireman's Fund, presided; about thirty were present. The outcome of the discussion was to charge Chairman Page with the appointment of a committee of three, who will investigate the whole matter and report back their findings.

Mr. Page's committee selection was as follows: Chairman, Hendon Chubb; Galloway C. Morris, third vice-president of the Insurance Company of North America, and W. J. Roberts, United States manager of the Standard Marine of Liverpool.

The measure passed by the Canadian Parliament on June 30 is entitled "Inland Water Freight Rates Act, 1923." The section that especially interests the underwriters and brokers is No. 7. That section, and the penalty provided for its violation, are as follows:

It shall be unlawful for any person who is a vessel broker or person engaged or acting as agent or otherwise in the chartering of any vessel or in contracting for the hire or letting of cargo space for the carriage of grain from Fort William or Port Arthur to any port or place in Canada or in the United States by lake or river navigation to solicit any risk, or to issue or deliver any receipt or policy of insurance or to collect or receive any premium in whole or in part, or to inspect any risk, or to adjust any loss, upon, for or in connection with any consignment of grain so to be carried.

Anyone who counteracts any provision of Sections 6 or 7 of this act, or who fails or neglects to comply with any of the provisions thereof to which he is subject, shall be guilty of an offence and liable therefor to a penalty not exceeding \$1,000 and not less than \$100, or to imprisonment for a term not exceeding three months, or, if a corporation, shall be liable to a penalty not exceeding \$3,000 and not less than \$500; and any such offence may be prosecuted and the penalty therefor enforced or recovered either upon indictment or upon some reconviction before any police, stipendiary or other magistrate having jurisdiction of two justices of the peace.

This act is intended to regulate shipping rates of grain transported for interprovincial, foreign or export trade; it shall therefore not apply to grain carried locally to be ground or to be consumed in the province in which the shipment originates, but the burden of proof that any shipment of grain is within the exception shall rest upon the carrier.

In view of this drastic movement it appears to be a question as to whether there can be devised some method of concerted action as respects the handling of lake grain insurance,

or else an abandonment of the situation to promiscuous "sharp-shooting" at accounts, with the consequent probability of a general rate war. Those who were party to the old vessel agency combination would, very naturally, like to see something of the sort reinstated; while the outsiders find, in the present mix-up, a fine opportunity to break in and "get theirs." It is suggested that an effective device would be the establishment at Winnipeg of a company that could act as a kind of insurance clearing house through which coverage might be effected for all the assured in one central agency, and thus stabilize rates and conditions. The action of Canada is bound to be felt by American underwriters. If the vessel charterer may no longer pass his charge along to the insurer, it means that insurance rates will now be quoted on a net basis. The question is, what is the net rate to be? Will the net rate, plus the commission, represent much, if any, difference to the underwriter as compared with the 35 percent regularly paid the vessel agents under the old arrangement?

Lake grain is carried in freighters that are the property of the big steel companies. When the movement of ore has largely subsided and grain is demanding shipment, in the fall, it has been customary for the vessel agents to arrange for the chartering of whole fleets from the steel men, which is naturally a much more satisfactory arrangement for the latter than to bother over getting individual grain shipments, here and there, for their idle vessels. The charterers, being in possession of practically all the transportation facilities of the lakes, then dispose of cargo space to shippers, and in lieu of a chartering fee reserve to themselves the placing of the insurance. As has been stated above, they are paid a commission of 35 percent by the underwriters. Out of that commission the charterer pays all handling charges, for loading and unloading, demurrage, etc., etc. The assumption of these charges is a matter of great importance to grain dealers. At Winnipeg, for example, the most active competition exists among dealers, and their quotations not infrequently are so close as to leave a possible profit of scarcely one-eighth of a cent a bushel. What would become of this narrow margin, if an unexpected demurrage charge had to be met? It would certainly mean a loss at Montreal. Thus we find the Canadian dealer already groaning under the new law, and in a frame of mind to welcome some sort of a return to old conditions.

Prove Insurable Interest

JUSTICE FORD, of the Supreme Court of New York County, in a recent decision emphasized the essential importance of establishing insurable interest in merchandise covered under a marine insurance policy, if a plaintiff hopes for recovery.

Action had been brought by Anthony A. Lutfy against the Bankers' and Shippers' on a policy issued to W. Reed Williams, and/or as agent, which the plaintiff contended had been assigned to him together with all claims under it. He then declared that a loss from theft and pilferage had occurred while the cargo was on board the steamer *Charlton Hall* en route from New York to Santiago. Counsel for the insurance company raised the contention that there no longer existed the old legal distinction between the requirements of insurable interest in marine policies and fire policies, and that, in order to recover, a person suing on a policy of marine insurance must allege an insurable interest and establish facts showing such an interest at the time of the loss.

A request was made for such a ruling, the argument being that otherwise marine insurance policies would be subject to condemnation by the statute of the State of New York avoiding wagers and gambling contracts of every sort. Decision was reserved by the court at the time, but Justice Ford has now handed it down, sustaining the contentions of the attorney for the Bankers' and Shippers'.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Barrels of Oil per Knot

Q. (1,214).—What is the average consumption in barrels of oil per nautical mile?

A. (1,214).—It is impossible to answer this question as worded as the power and speed of the vessel enter into the problem.

Assuming the indicated horsepower as 2,200, speed of vessel 12 knots and pounds of fuel oil per indicated horsepower as 1.4, then the fuel consumption per knot would be

$$\frac{2,200 \times 1.4}{12 \times 316} = 0.812 \text{ of a barrel.}$$

Average Miles per Barrel of Oil

Q. (1,215).—What are the average miles per barrel of oil?

A. (1,215).—Making the same assumptions as in Q. (1,214) the nautical miles per barrel would be

$$\frac{316 \times 12}{2,200 \times 1.4} = 1.23$$

Formula for Block Coefficient

Q. (1,217).—Is there any method of obtaining the displacement and block coefficient of a steamer when no drawings of the hull are available?—C. R. K.

A. (1,217).—The one can not be determined without the other unless drawings are available. Should the displacement be known the block coefficient may be figured, or vice versa, from the formula

$$\text{Block coefficient} = \frac{\text{Displacement} \times 35}{\text{Length} \times \text{Beam} \times \text{Draft}}$$

where length is at waterline and beam is the greatest immersed breadth.

Rate of Depreciation of Steel Ships

Q. (1,219).—I am particularly interested, at present, in obtaining data on the actual rate of deterioration in steel vessels (or other steel structures in which the conditions would be similar) or on what might be termed the "progressive depreciation," i. e., assuming that the percentage, whatever it might be, would not be uniform, but would increase on a sliding scale with the age of the vessel, what should this scale be?

A. (1,219).—As you suggest, the depreciation in ships probably does not progress at a constant rate. However, there are so many contributing causes that it is difficult to establish from actual practice any law that may be considered to apply with even a fair degree of accuracy.

Probably one of the principal causes of depreciation in the value of ships has nothing to do with the deterioration in the material of the hull or with the wear and tear on the machinery. It is the impossibility of keeping ships or their

equipment, when they once enter service, strictly up to the latest requirements of that service. For instance, it has been stated that ten years is about the useful life of certain types of cargo carriers on the Great Lakes due to the constant progress made in loading and handling appliances and in the size and speed of the vessels used in this service. Of course, these vessels are not worn out at the end of so short a period but they are obsolescent, if not actually obsolete, at the end of this period. In a similar manner, high class Atlantic passenger vessels are continually being transferred from this to other services less exacting as new devices contributing to luxury, comfort, safety or economy are from time to time introduced rendering vessels not so equipped obsolete by that much.

If the question of obsolescence be ignored, we are not much better off unless it is possible to examine in detail carefully kept cost sheets for a large number of vessels over a long period of years. The repairs made and paid for from time to time are often contingent upon the conditions of the service or business or upon the urgency of the repairs themselves. It results that a vast amount of research is necessary in order to discover any general trend. The following figures for two large sea-going tugs will serve to illustrate this point. These figures cover costs under the head of wear and maintenance for hull only.

Years elapsed since entry upon service	Cost—Wear and Maintenance	
	Tug No. 1	Tug No. 2
1	\$514	\$947
2	1,673	578
3	7,448	2,869
4	3,433	3,367
5	3,133	5,018
6	9,421	7,924
7	106	13
8	789	9,205
9	13,664	8,077
10	7,684	8,520
11	489	3,847
Total for 11 years.....	\$48,354	\$50,365

Approximately the same amount was spent on each of the two vessels. In each case the amount expended during the last five years was greater than that expended during the first five years. If, however, these costs be plotted upon a time base, they do not indicate with any certainty a law governing expenditures for a given time in service.

The following figures taken from a paper by John Hick read in 1907 before the North East Coast Institute of Engineers and Shipbuilders are of interest:

- Of 28 steel boilers removed from ships—
- 6 had been in service 8 to 12 years and were removed because of overheating.
- 3 had been in service 8 to 14 years and were removed because of corrosion.
- 4 had been in service 13 years and were removed because of corrosion of combustion back or uptakes.
- 2 had been in service 23 years and were removed because of front tube plate corrosion.
- 2 had been in service 7 years and were removed because of chamber stays corrosion.
- 6 had been in service 16 to 20 years and were removed because of wastage of boiler shell.
- 5 had been in service 25 years and were removed to fit new boilers.

In the same paper three instances of deck plating removal after 13 years' service due to corrosion are given.

It is understood that the regular British practice is to set aside annually for depreciation at the rate of 5 percent of a vessel's first cost. Thus funds become available for replacement after about 20 years of service.

LETTER TO THE EDITOR

The Diesel and the Future

TO THE EDITOR:

Professor Chapman has shown some very interesting figures in the pages of this magazine, particularly in connection with the operating costs of Diesel vessels. These figures are so complete and have been so well worked out that they may safely be taken as a guide for shipowners to follow in considering the question of Diesels versus steam. In general terms, it is brought out that the saving in fuel in the Diesel is practically offset by the capital charges, in the cases of new tonnage.

There are certain factors, however, which should be carefully considered by shipowners in shaping their policies for the future, and I fully believe that the Diesel question should be closely analysed, both as to its present and its future. It is not enough for us to say that from the present viewpoint the decision is a toss-up. We know what it will cost us today to build two similar ships, one steam and one Diesel, and we know that the operating expenses will be about the same, including capital charges. This condition, however, may be altered in a day by the cost of steel, the cost of labor, the price of oil, the world freight market and countless changes in operating conditions. We might favor the steam plant this year and the Diesel next, purely from the standpoint of dollars and cents.

Personally, the writer has unlimited enthusiasm for the Diesel, believes in its theory and merit, and fully expects the Diesel to supplant steam, nor is this any new idea with him. But this enthusiasm has been kept in check because the balance sheet does not as yet entirely prove that the Diesel is to supplant the steam. Of course, from an engineering viewpoint, the Diesel is almost a thing of beauty. Here is a machine which burns its own fuel and has no losses other than those contained within the engine itself. No transfer of heat from oil to water through boiler steel, no British thermal units going to waste in the stack and atmosphere, no long steam leads from boilers to engines. This Diesel engine per horsepower saves two-thirds of the fuel and with it all is efficient and reliable. These points do not have to be proved to engineers. The only question is, will we be able to take advantage of this saving and run our ships at greater profit than with steam? The answer is somewhat uncertain.

In the first place, however, let us turn back to the advent of steam over sail, when our clippers were running rings around everything on the high seas. We were masters of the whole situation in those days, and the world acknowledged us as such. We had cheap materials, efficient shipbuilders, shrewd shipowners and dauntless seamen. We had the world beaten at one of its oldest games. Even after our competitors copied our designs, we still outsailed them, and they were forced to find some new method or acknowledge defeat.

They found their new method in utilizing steam instead of winds, and when they adopted it, our own people, believing that they were securely seated at the top of the world, looked on with a feeling of indifference. We considered steam—and turned it down with what is now clear evidence of lack of foresight. Our ships disappeared slowly from the sea, from which they have continued to be conspicuous by their absence.

The present day value to us, of this tremendous mistake of the past, should cause us to look into the Diesel question so clearly that we cannot go wrong. Nor is it a question for engineers only, it is the real live issue today which should be right before the board of directors, whose decision should not be based on today but upon the probable events of the next twenty years. Clear vision and clear thinking are required.

Secondly, what information can we gain from developments in Europe? The British, Danes and Norwegians, whose present maritime prestige need not be discussed, are going into Diesels in no half-hearted way. Look over any shipping publication and you find a new motorship proposed, laid down or launched, and even a double acting Burmeister & Wain is being built after successful experiments have proved its worth. Hardened Scotch engineers, masters of the steam job, are looking with favor on the new engine, and who could be more difficult to convince? Motorships have arrived on the other side of the Atlantic for permanent service and the European engineers are pretty clear thinking people. They would not now be building motorships, if they had not looked clearly into the economic possibilities involved, just as they saw what steam would do almost a century ago.

In the third place (and this seems the meat of the whole proposition), what is the future of the oil supply? If the writer recalls correctly, the geologists have set some sort of a definite limit to the oil supply of the world, yet fortunately for us, every now and then some new oil field develops which gives us a little more oil in sight. We will hope that new fields will always be coming through the earth's crust in order that the world may continue to benefit by this wonderful fluid fuel. Still, the oil supply is not nearly so well guaranteed as the coal, but regardless of the limit to the future supply, how are we to account to posterity for the millions of tons which are wasted annually in steam plants of all kinds?

If there were only two hundred oil burner steamers in the world today, and each of these vessels burned seven thousand tons a year, the preventable loss of energy amounts to more than one million tons of fuel oil, for this is approximately what would be saved, if the two hundred ships were Diesel engined. The same cargoes could be carried, the same speed would be maintained, and ten million dollars would be saved on the fuel bill. Furthermore, if every oil burning freighter in the world today were converted to Diesel, and thus materially cut into the demand for oil, the price would go down and a further saving to the shipowner would result. Going further into the conservation of energy involved, it would be a positive national asset, if we could cut down the rate at which we are now burning oil, exhausting nature's bounty just because it happens to flow.

The day may not be far off when certain legislative restriction will be placed on the use of oil; we may also witness the day of our own oil supply running so low that we will have to import for our own uses, at which time we may be forced to choose between coal and Diesels. These and other conjectures ought to have our closest attention, and no decisions made without full possession of all the facts. This problem is none too small for the best minds among our financiers, engineers, geologists and statesmen, and even we lay-people, whose ordinary function is to "carry on," ought to contribute our thoughts and ideas.

In conclusion, and in reiteration, the writer believes that the Diesel is not only holding its own, but will make immense strides in the future. The signs point to an age of oil-engined propulsion, certainly for cargo carriers, probably for passenger vessels. Will we accept our opportunity or refuse it?

New York.

K. H. DONAVIN,

Assistant Manager, Operating Department
International Mercantile Marine Company

PERSONAL MENTION

C. P. KRAMER is acting secretary of the United States Shipping Board.

SIR JOHN BILES, the eminent British naval architect, was a visitor in New York last month.

HARRY ANNING, formerly Portland manager for Sudden and Christenson, has joined the staff of Norton Lilly and Company.

FRED CHASE, for seventeen years with the Admiral Line, has been appointed general agent for Struthers and Barry at Los Angeles, Cal.

THEODORE H. JACOBS is in charge of the Pacific coast passenger office of the United American Lines at 230 California street, San Francisco.

KIRKWOOD H. DONAVIN, formerly assistant to the manager of operations at the International Mercantile Marine Company's Chelsea Piers, New York, has been appointed resident representative at San Francisco of the operation department of the Panama-Pacific Lines. Born in Ohio in 1886, Mr. Donavin was educated for American naval service and graduated from the Naval Academy in Annapolis in 1908. For five years he was on naval duty in Pacific waters and for a year he was stationed in the Far East. He also spent five years in submarine service. In 1920 he was on the staff of Admiral Hilary P. Jones, now commander of the fleet. Upon leaving the

Navy in 1920, Mr. Donavin joined the shore staff of the International Mercantile Marine Company, New York.

CLIFFORD SMITH, formerly secretary of the United States Shipping Board, has become assistant to the managing director of the Board for Brazil.

A. P. ALLEN, formerly sales manager of the Federal Shipbuilding Company, Kearny, N. J., has become associated with Pacific coast lumber interests.

GORDON P. WHITE, one of the directors of the Baltimore Chamber of Commerce, has become a partner in the firm of Adams and Company, steamship agents and brokers of Baltimore.

A. T. B. SHIELS, former American Bureau of Shipping surveyor, has opened an office for general practice as marine surveyor and consulting engineer at 412 Bay Building, 1213 First avenue, Seattle, Wash.

EDWARD P. FARLEY, chairman of the Shipping Board, has been elected president of the Emergency Fleet Corporation. At the same time the scope of the duties of Vice-President Sidney Henry have been broadened to include, in addition to the general supervision of the Department of Sales and Finance, the administrative department, statistical department, the personnel division, the department of investigation and the field forces.

JOHN F. LAMCKE, formerly port engineer for the Shipping Board during the war; assistant superintending engineer for

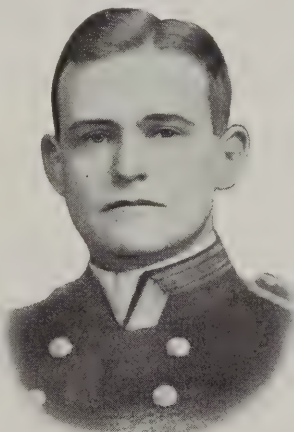
the Cosmopolitan Steamship Company, Port of New York; superintendent engineer of the Green Star Steamship Company at Baltimore and consulting engineer and marine surveyor at Baltimore, has joined the Maintenance and Repair Department of the United States Shipping Board, 45 Broadway, New York.

CAPTAIN REGINALD ROWEN BELKNAP, U. S. N., commanding officer of the new battleship *Colorado*, commissioned last month at the yards of the New York Shipbuilding Corporation, Camden, N. J., entered the Naval Academy in 1887. He served in the Spanish war, the Philippine insurrection and the Boxer campaign and in 1909 was decorated for service in connection with the Messina earthquake relief. From 1915 to 1917 he was commander of the mine laying and mine sweeping branch of the Atlantic fleet and in May, 1917, he was promoted to the rank of captain. Captain Belknap was awarded the Navy Distinguished Service medal for service in connection with fitting out and afterwards commanding the American mine laying squadron in the northern mine barrage operation in the North Sea. From 1919 to 1920 he was in command of the battleship *Delaware* and more recently was on the staff of the Naval War College.



Captain R. R. Belknap, U. S. N.

LIEUTENANT-COMMANDER F. T. LEIGHTON, U. S. N., has been appointed engineering officer of the battleship *Colorado* and assumed his duties with the commissioning of this new vessel at Camden, N. J., last month. Lieutenant - Commander Leighton was appointed to the Naval Academy at Annapolis from Pennsylvania in 1905. After his graduation from the Naval Academy and subsequent service at sea Lieutenant-Commander Leighton entered the Post-Graduate Engineering School from which he was graduated in 1917. During the World War he served as executive and repair officer of the United States submarine tender *Savannah*; later he was assigned to special duty abroad and was stationed in London.



Lt.-Commander F. T. Leighton, U. S. N.

Biography of Sir William White

Messrs. E. P. Dutton & Company, 681 Fifth Avenue, New York City, will shortly publish an American Edition of the "Life of Sir William White." This biography covers the whole period of naval construction from the beginning of steam propulsion and the building of iron ships to the opening of the *Dreadnought* era and the fitting of the *Mauretania* with turbines. It thus covers the most important period in the development of naval architecture and marine engineering and becomes a valuable work of reference.

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

Chief Engineers of Shipping Board Ships Honored for Efficiency

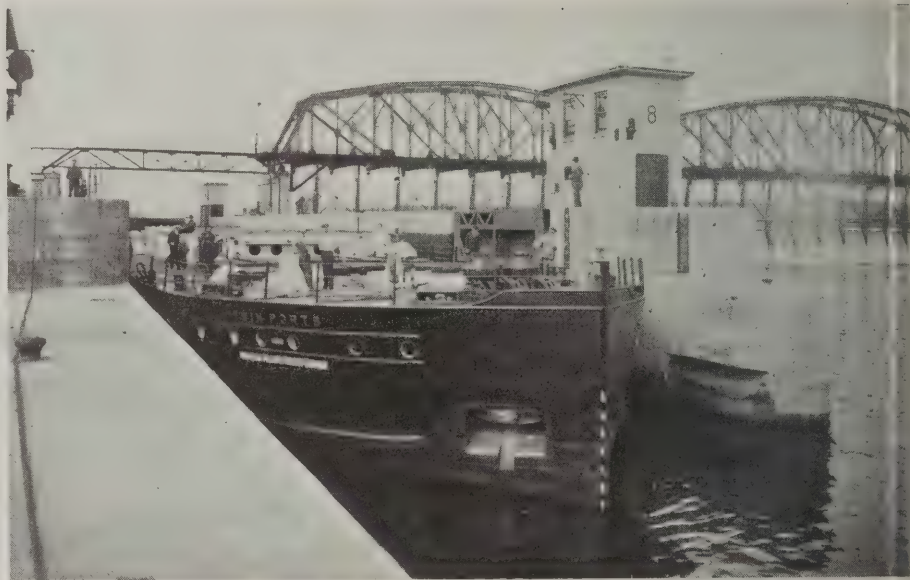
THE Fuel Conservation Committee of the United States Shipping Board, which was organized about a year ago by Joseph E. Sheedy, vice-president of the Emergency Fleet Corporation, has announced the first list of chief engineers who have shown outstanding efficiency in the operation of Shipping Board vessels during the past six months. At this time it is only possible to include in this list the chief engineers operating vessels out of the Port of New York, but in the future the committee will issue quarterly reports that will include other principal ports.

The fuel bill is the largest item of the operating costs, and it is, therefore, the logical place to help reduce the handicap under which American vessels are laboring in their competition with foreign shipping. The amount of fuel that is burned is under the direct control of the chief engineer, and the Fuel Conservation Committee, much to its gratification, has found that the engineers have appreciated its work of determining how much fuel the numerous types of Shipping Board vessels ought to consume, and are giving their hearty cooperation.

There has been a decided improvement all along the line, not only because the engineers have been given a standard to aim at but also because it is only human for a man to do his best when he knows that some one having authority is taking interest in what he accomplishes. The following honor list includes only those who have shown exceptional ability. There are several chiefs who are close to the mark and there will probably be several new names in the next report.

Honor List

Chief Engineer	Vessel	Operator
Adams, C. S.,	<i>West Cherow</i> ,	Black Diamond S.S. Corp.
Anderson, C.,	<i>Pres. Garfield</i> ,	U. S. Lines.
Anderson, J.,	<i>Ala</i> ,	Black Diamond S.S. Corp.
Augustine, L.,	<i>Stanley</i> ,	Barber S.S. Lines, Inc.
Barr, E. R.,	<i>Arcturus</i> ,	Kerr S.S. Co., Inc.
Becker, J. S.,	<i>Independence</i> ,	Barber S.S. Lines, Inc.
Bernson, E. N.,	<i>Eclipse</i> ,	Barber S.S. Lines, Inc.
Blanchard, W. H.,	<i>Haleakala</i> ,	International Freight-ing Corp.
Brennan, P.,	<i>America</i> ,	U. S. Lines.
Bridges, W. L.,	<i>Easterner</i> ,	U. S. and Australasia Line.
Brown, Geo.,	<i>Elkton</i> ,	Barber S.S. Lines, Inc.
Cook, C.,	<i>Pres. Fillmore</i> ,	U. S. Lines.
Crisp, G. B.,	<i>McKeesport</i> ,	Cosmopolitan Shipping Co., Inc.
Cuming, C.,	<i>Endicott</i> ,	Barber S.S. Lines, Inc.
Davison, E. L.,	<i>Schodack</i> ,	Cosmopolitan Shipping Co., Inc.
Edes, E. N.,	<i>William Penn</i> ,	Barber S.S. Lines, Inc.
Fleming, A. O.,	<i>American Legion</i> ,	Munson S.S. Line.
Fletcher, W. A.,	<i>Ala</i> ,	Black Diamond S.S. Corp.
Goldman, H.,	<i>West Camak</i> ,	International Freight-ing Corp.
Hanlon, M. J.,	<i>Pres. Harding</i> ,	U. S. Lines.
Hodgekiss, W.,	<i>George Washington</i> ,	U. S. Lines.
Kelly, J. D.,	<i>The Lambs</i> ,	Kerr S. S. Company, Inc.
Meagher, J.,	<i>Argosy</i> ,	Wessel Duval & Co.
Nash, N. E.,	<i>West Nohno</i> ;	Bull, A. H., & Co.
Pancott, A.,	<i>Waukegan</i> ,	Cosmopolitan Shipping Company, Inc.



Motorship *Twin Ports* Passing Through Locks Near Amsterdam, N. Y., on Maiden Voyage Through New York State Barge Canal

First Diesel Electric Motorship from the Lakes Makes Maiden Trip Through New York State Barge Canal

MANEUVERING with the utmost ease and handling like an old and tried vessel, the Diesel electrically propelled Great Lakes and canal motorship *Twin Ports*, of the Minnesota Atlantic Transit Company completed her maiden voyage between Ashtabula and New York, docking at the latter port on September 20. She carried a bulk cargo of rye and was accompanied through the New York State Barge Canal by a party of engineers and shipping men.

The first trip of the *Twin Ports* followed immediately upon the official trials held at Ashtabula, which came up to and exceeded

every expectation of her designers and builders. The voyage through the Welland Canal, down the Erie Canal and through the Hudson waterway was made without a hitch. A. Miller MacDougall, president of the Atlantic Transit Company, declared the Diesel electric propulsion to be unsurpassed for the class of service and was high in his praise of the vessel's performance.

The *Twin Ports* is a steel electrically driven motorship, designed by Henry Per-ton, of Cleveland, Ohio, and constructed by the Great Lakes Engineering Works, Detroit, Mich., at their Ashtabula, Ohio, plant. The electrical propelling machinery was supplied by the General Electric Company, Schenectady, N. Y.

The principal dimensions are as follows:

Length overall	258 feet
Beam	42 feet
Depth	18 feet
Draft	10 feet
Speed	10 miles
Cargo capacity	2,600 tons
Refrigerated cargo	600 tons

PROPELLING MACHINERY

The propelling machinery consists of two 375 horsepower, 6-cylinder, 4-cycle Diesel engines, built by the Lombard Governor Company, of Ashland, Mass. Each engine is directly connected to a 250-kilowatt generator and operates at a speed of 260 revolutions per minute.

These two main generators work on a common bus bar, so that the two propelling motors are assured of an equal distribution of

Parker, H. C.,	<i>Eastern Planet</i> ,	U. S. and Australasia Line.
Pierce, C. J.,	<i>Homestead</i> ,	Kerr S.S. Company, Inc.
Rakow, J. W.,	<i>Pres. Arthur</i> ,	U. S. Lines.
Ramm, P. F.,	<i>West Cherow</i> ,	Black Diamond S.S. Corp.
Richardsen, J. L.,	<i>Pan America</i> ,	Munson S.S. Line.
Robbins, E. S.,	<i>Pres. Roosevelt</i> ,	U. S. Lines.
Stuart, B. M.,	<i>Southern Cross</i> ,	Munson S.S. Line.
Styron, A. W.,	<i>Pres. Van Buren</i> ,	U. S. Lines.
Svatridge, W.,	<i>Pres. Polk</i> ,	U. S. Lines.
Thompson, G.,	<i>Scottsburg</i> ,	Barber S.S. Lines, Inc.
Thompson, T.,	<i>Archer</i> ,	Barber S.S. Lines, Inc.
Thomson, J. W.,	<i>Western World</i> ,	Munson S.S. Line.
Thorsky, M.,	<i>Vincent</i> ,	Cosmopolitan Shipping Company, Inc.
Trent, T.,	<i>Conejos</i> ;	Bull, A. H., & Co.
Turpin, J. E.,	<i>Nile</i> ,	Kerr S.S. Company, Inc.
Winlaw, T.,	<i>Eastern Moon</i> ,	U. S. and Australasia Line.
Yandell, F.,	<i>Pres. Adams</i> ,	U. S. Lines.
Ziegenfuss, C. B.,	<i>Wehika</i> ;	Winchester, J. H., & Co., Inc.

power. The current from this bar is supplied to the two propelling motors which are of 250 horsepower. All the motors are operated at a normal speed of 180 revolutions per minute.

NOVEL FEATURES

An unusual feature of the machinery installation is the fact that both main engines are installed with the axis of their crankshafts athwartships instead of longitudinal. Another innovation is the control of these engines which is entirely in the hands of the captain in the pilot house. The engineer on watch has no knowledge of what the captain may be doing. He can, however, note the amount of power being used at any time by looking at the switchboard. In this way the time of announcing the captain's orders to the engine room is saved.

These engines differ from most Diesel designs in that the valve gears which run right across the top of the engines and the piping all stay in place when the pistons are removed. The pistons, as will be surmised, are removed from the bottoms of the engines.

Each engine carries its own air compressor, delivering injection air at about 850 to 900 pounds per square inch. The compressors are directly connected to the main engine and are of the three-stage type. The forced lubricating oil system is also directly driven by means of gears from the main engine.

AUXILIARY ENGINE

There is also installed an auxiliary engine of 60 horsepower which runs at 360 revolutions per minute and which is directly connected to a 40-kilowatt generator. This auxiliary engine, however, is not connected for driving the auxiliaries when the vessel is at sea. This is done by the main engine when under way. The auxiliary power is for port service only, except in the case of emergency.

AUXILIARY MACHINERY

All the auxiliary machinery is driven by motors. In the engine room there is one water circulating pump of the centrifugal type of 7½ horsepower; one general service pump of 20 horsepower of the plunger type which may also be used as a standby as a circulator; one rotary balance pump of 10 horsepower; one lubricating oil pump of the plunger type which is a standby in case the pump directly connected to the engine fails; one fuel oil transfer pump of the plunger type of 3 horsepower; one emergency compressor of the Winton type of 6½ horsepower, and one emergency 5-kilowatt kerosene Winton set.

DECK MACHINERY

All deck machinery is electrically driven, including the steering gear and windlass. The heating is all electric throughout the ship. Maxim silencers for the exhaust gases furnish hot water for the daily supply tanks and for heating the fuel oil in the double bottom.

TRIAL TRIP

On the trial trip, which was held between Ashtabula and Cleveland, a speed of 9.6 miles was obtained, but in deep water, while running down the Hudson river, the vessel made over 10 miles.

Mr. H. Schreck, chief engineer of the Lombard Governor Company, was highly gratified by the performance of the vessel and prophesies that many more of her type will be constructed for the canal in the near future. In the winter months the *Twin Ports* is scheduled to operate in the coastal service between New York, southern ports and the West Indies, carrying refrigerated and other perishable cargoes.

Penn Bridge Company Offers Lowest Price for Construction of Six Steel Barges for Government

AT the opening of tenders by the United States Engineer Office, of Montgomery, Ala., on September 10, for three steel barges 80 feet by 26 feet by 5 feet, and

three barges 60 feet by 22 feet by 4 feet, the Penn Bridge Company, of Beaver Falls, Pa., was low bidder. The prices submitted were as follows:

Name and Address	Amount	Delivery, Days	Barges, Number	Size
Penn Bridge Co., Beaver Falls, Pa.....	\$72,850.00	250	Six	Three 80'x26'x5' Three 60'x22'x4'
Nashville Bridge Co., Nashville, Tenn..	15,485.00 31,990.00 46,925.00 27,480.00 73,900.00	150 170 190 190 240	One Two Three Three Six	80'x26'x4' 80'x26'x4' 80'x26'x4' 60'x22'x4' As above
Charleston Dry Dock & Machine Co., Charleston, S. C.....	16,336.00 31,672.00 48,008.00 28,692.00 76,700.00	240 240 240 180 240	One Two Three Three Six	80'x26'x5' 80'x26'x5' 80'x26'x5' 60'x22'x4' As above
Bethlehem Shipbuilding Corporation, Ltd., 25 Broadway, New York, N. Y.*.....	52,225.00 32,525.00	185 185	Three Three	80'x26'x5' 60'x22'x4'
The Dravo Co., Diamond Bank Bldg., Pittsburgh, Pa.	52,500.00 33,150.00 85,650.00	195 180 195	Three Three Six	80'x26'x5' 60'x22'x4' As above
Midland Bridge Co., Midland, Pa.....	86,000.00	300	Six	Three 80'x26'x5' Three 60'x22'x4'

*If awarded, 6 barges take 235 days to deliver.

198 Steel Vessels of 164,236 Gross Tons Under Construction or Contract for Private Ownership on August 1

ON August 1, 1923, American shipyards were building or under contract to build for private shipowners 198 steel vessels of 164,236 gross tons, compared with 203 steel vessels of 172,301 gross tons on July 1, 1923.

There were 8 wood vessels of 1,004 gross tons building or under contract to build for private shipowners during the same period, compared with 5 wood vessels of 1,004 gross

tons on July 1, 1923. These figures do not include government ships or ships building or contracted for by the United States Shipping Board.

Following is a summary of reports of shipyards to the Bureau of Navigation, Department of Commerce, showing the number and gross tonnage of steel and wood vessels of 100 gross tons and over under construction or contract for private owners on August 1, 1923:

Companies	Steel		Wood	
	Number	Gross tonnage	Number	Gross Tonnage
American Bridge Co., Ambridge, Pa.....	106	50,100	..	..
American Shipbuilding Co., Cleveland, Ohio.....	5	34,784	..	..
Arthur D. Storey, Essex, Mass.....	..	..	1	140
B. H. Elliot (Inc.), Houston, Tex.....	..	..	1	100
Bethlehem Shipbuilding Corporation (Ltd.):				
Baltimore Dry Docks Plant, Baltimore, Md.....	1	920	..	..
Harlan plant, Wilmington, Del.....	2	792	..	..
Sparrows Point plant, Sparrows Point, Md.....	3	13,600	1	500
Booz Brothers, Baltimore, Md.....	..	..	1	144
Charles Ward Engineering Works, Charleston, W. Va.....	4	1,030	..	..
Craig Shipbuilding Co., Long Beach, Calif.....	2	760	..	..
Dravo Contracting Co., Pittsburgh, Pa.....	17	6,895	..	..
Federal Shipbuilding Co., Newark, N. J.....	2	2,495	..	..
Geo. Lawley & Son Corporation, Neponset, Mass.....	2	550	..	..
Great Lakes Engineering Works, Ashtabula, Ohio.....	2	3,200	..	..
Howard Shipyards Co., Jeffersonville, Ind.....	2	995	..	..
Ira S. Bushey & Sons (Inc.), Brooklyn, N. Y.....	..	..	3	..
James Rees & Sons Co., Pittsburgh, Pa.....	1	175	..	..
John H. Mathis Co., Camden, N. J.....	1	450	..	..
Johnson Iron Works, Dry Dock & Shipbuilding Co., New Orleans, La.....	1	250	..	..
Los Angeles Shipbuilding & Dry Dock Corporation, Los Angeles, Calif.....	3	712	..	..
Marietta Manufacturing Co., Point Pleasant, W. Va.....	10	3,279	..	..
Nashville Bridge Co., Nashville, Tenn.....	4	1,060	..	..
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.....	2	7,750	..	..
New York Shipbuilding Corporation, Camden, N. J.....	13	16,715	..	..
Pusey & Jones Co., Wilmington, Del.....	2	1,270	..	..
Staten Island Shipbuilding Co., Mariners Harbor, N. Y.....	5	1,200	..	..
Sturgeon Bay Dry Dock Co., Sturgeon Bay, Wis.....	1	1,000	..	..
Sun Shipbuilding Co., Chester, Pa.....	4	1,119	..	..
Todd Dry Dock & Construction Corporation, Brooklyn, N. Y.....	1	225	..	..
Toledo Shipbuilding Co., Toledo, Ohio.....	2	13,000	..	..
Vinyard Shipbuilding Co., Milford, Del.....	..	..	1	120
Total	198	164,236	8	1,004

Two Ferries and Two Barges to Be Built in Connection With New Orleans Terminal Service and Development

THE Algiers Public Service Company, Inc., of New Orleans (Algiers), La., is having plans and specifications prepared for the building of two new catamaran type ferries for service from New Orleans to Algiers, across the Mississippi River. The vessels are to replace the present steamers of similar type, which are to be used at Barracks and Olivier streets after being considerably altered and given a general overhauling.

The proposed new boats are to have a length of 150 feet, beam 65 feet, and will burn oil for fuel. They will be fitted to carry passengers on the upper decks and vehicles on the lower deck and will be in general larger and more modern than their predecessors.

TWO BARGES PLANNED

The same company has issued plans and specifications for two pontoon barges 90 feet long, having a beam of 30 feet and seven feet deep, bids for which were received last month. The vessels are also for use at Barracks and Olivier streets, which terminal is to be a complete new installation on both sides of the river. It will comprise ferry houses, bridges, pontoons, piling supports, hoisting devices, etc.

The Canal street terminals, where the new ferries will be used, will also be a new development, with pontoons, bridges, piling, ferry houses, hoisting devices, etc. The Algiers Public Service Company is building or taking care of the Algiers side of the improvements and the Dock Board is building the New Orleans terminal in conjunction with beautification plans for the head of Canal street. Modern equipment will be used throughout the development.

Contract for Reconditioning U. S. Seagoing Dredge Atlantic Awarded to Morse Dry Dock & Repair Company

THE contract for extensive repairs and reconditioning work on the U. S. seagoing dredge *Atlantic*, has been awarded the Morse Dry Dock & Repair Company of Brooklyn, N. Y., following the opening of bids by the United States Engineer Office, 39 Whitehall Street, New York, on September 12.

The specifications provided for a large amount of various work on the hull and extensive repairs to the engines and the auxiliary machinery. The installation of oil tanks and oil burning equipment with the necessary heaters, pumps, etc., was also provided for. The bids submitted were as follows:

	For all work except Par. 24, 57, 71 and 72.	Par. 67.	Work under 71 and 72.	Par. 71 and 72.	Time for work except Par. 71 and 72.	Time for work except Par. 67.	Per cu. yd. for re-moving mud.	Per lb. for old castings.
Morse	\$41,000	\$3,110		\$35,115	20 days	35 days	\$3.50	.0025
Robins	45,850	2,900		32,900	40 days	40 days	3.50	.005
Tietjen & Lang	47,774	3,010		34,845	42 days	42 days	3.50	.005
W. & A. Fletcher	53,600	4,500		38,500	33 days	45 days	3.25	.003
Staten Island Shipbuilding Co.	53,990	3,470		46,790	30 days	40 days	3.50	.0075
Federal	55,000	5,000		48,000	35 days	48 days	3.25	.004
Bethlehem	81,800	8,700		65,000	100 days	140 days	2.00	.005

Paragraphs 24 dealt with the removal of material in the bins after the dredge was docked; 67 with boilers, fire room and bunker work, material to be furnished by contractor;

71 with the building of two oil tanks, one on each side of the dredge, and 72 with the furnishing and installation of an oil burning equipment.

Reconditioning of Five Army Transports to Replace "502's" Is Planned By Shipping Board

THE conversion and reconditioning of five army transports for the replacement of the "502" ships recently sold by the government to the Dollar Line is under consideration by the Shipping Board. It is understood that preliminary plans are being prepared for the preparation of five of the Hog Island type "B" ships, laid up in the James River, for service as freight steamers on the London route for the United States Lines.

It is believed that the reconditioning work will include the addition of refrigerator spaces for cargo, a general rearrangement of the ships and the possibility of later fitting them to carry a limited number of passengers. The ships are 448 feet long, equipped with geared turbines and reduction gears.

Although official figures were not obtainable, it is thought that the work to be done will involve an expenditure close to \$100,000 for each ship.

Seven "502" Ships Sold by Board to the Dollar Line

CHAIRMAN EDWARD P. FARLEY, of the United States Shipping Board, has announced the sale of seven combination freight and passenger ships, known as the 502 type, to the Dollar Line, whose home office is the Dollar Building, San Francisco. These vessels, the *President*, *Garfield*, *Monroe*, *Adams*, *Van Buren*, *Polk*, *Hayes* and *Harrison*, will be operated in an around-the-world service, starting at San Francisco and touching Japan, China, Philippines, Java, Straits Settlements, Singapore, India, through the Suez, Egypt, Mediterranean ports to New York, thence through the Panama Canal to home. By arrangement with the Board, this service is guaranteed for five years. This will be the first round-the-world service of this kind that has been inaugurated, for while the Dollar Company is maintaining freight boats on this service, there are no other ships now in a continuous service around the world under any flag.

The Shipping Board is of the belief that this service will be of great value to American travelers and merchants, and it will have the full support of the Board in its effort to build up an American merchant marine.

These ships were built by the New York Shipbuilding Company and are of 10,533 gross tons register and 6,195 tons net.

Contract for New Steamer Awarded to Midland Barge Co.

THE Midland Barge Company, Midland, Pa., has received a contract from the Louisville-Cincinnati Packet Company for the construction of a steel hull, side wheel five deck passenger and packet steamer. The vessel is to have an overall length of 291 feet 6 inches; beam molded, 45 feet 6 inches; beam over guards, 83 feet; depth molded, 7 feet 6 inches.

Engines are to be tandem compound, to be built by the Charles Barnes Engine Company, Cincinnati, Ohio, and steam is to be supplied by five boilers to be built by the Acme Boiler Company, Gallipolis, Ohio.

Annual Convention of Atlantic Waterways Association Nov. 13-16

"Get the American waterways in shape for work" will be the motto this year of the Atlantic Deeper Waterways Association, which will hold its sixteenth annual convention in Norfolk, Va., November 13-16, according to Mayor J. Hampton Moore, of Philadelphia, president of the organization, who has issued a call for a big attendance of business delegates.

He urged a representative attendance from the ports and sections whose commercial welfare will be affected by development.

Removal Notice

R. E. Lovekin Corporation will occupy the sixth floor of the Smith Building at the southeast corner of 18th and Market Streets, Philadelphia, Pa., after October 1, 1923.

Norfolk Ready to
Pay \$3,500,000 for
Army Supply Base

NORFOLK, Va., (Special)—The city of Norfolk has agreed to pay \$3,500,000 for the Army Supply Base here, exclusive of the two piers, on condition that it shall be allowed to lease the piers while the government desires to retain title to them and that it shall be permitted to purchase them for \$1,500,000 when the government no longer has need of them. The City has operated the Army Base facilities under lease as a municipal terminal, for about four years. The papers covering the transaction, prepared at a series of conferences between city officials, their counsel, Col. Jennings C. Wise, and members of the Shipping Board, and their attorney, John Nicholson, are ready for signatures.

Though the city desired to purchase both the piers and the shore property, which includes long rows of fireproof warehouses, miscellaneous buildings and fifty miles of tracks, offering the War Department \$5,000,000 for the whole of the property, the plan which has been worked out in the opinion of members of the port commission, is almost as advantageous to the municipality.

The value of the warehouses and railroad yards at the army base is directly dependent upon whether the owner of this property has ownership, or the right to use the two piers. Therefore, the contract for the transfer of the property has been drawn with a view to the protection of the city's interests. It is understood that the city is to receive title to the property on shore as soon as it signs the deed and that another deed, transferring the piers to the city when the government is willing to relinquish them, will be placed in escrow.

The government retains no waterfront, except that occupied by the two piers, and a strip on either side of them the width of half a slip.

Scholarships Awarded by Lloyd's
American Committee

THE quarterly meeting of the American committee of Lloyd's Register of Shipping, held in New York on September 5, was marked by the introduction to the committee of the first four successful candidates to be awarded the scholarships in naval architecture and marine engineering given by the committee.

These scholarships were established in the early part of 1922, one being allotted to the Massachusetts Institute of Technology, Cambridge, Mass., and one to the University of Michigan, Ann Arbor, Mich. Each scholarship has a value of \$500 per annum and is tenable for three years, subject to the satisfactory annual progress of the student. The first two scholarships were awarded in July, 1922, to students of the freshman classes of the above universities, Warner Lombard, of Dorchester, Mass., being awarded the scholarship at the Massachusetts Institute of Technology, and Christopher E. Blaydon of Detroit, Mich., that at the University of Michigan.

This year the committee has awarded the University of Michigan scholarship to Mark J. Ireland, Jr., of East Lansing, Mich., and the Massachusetts Institute of Technology scholarship to R. W. Rogers of Chicago, Ill. These four gentlemen were presented to the American committee of Lloyd's Register of Shipping by Alfred Gilbert Smith, chairman of the society, and president of the New York & Cuba Mail Steamship Com-

American Bridge Company Submits
Lowest Proposal for Construction
of 19 Steel Barges for Government

THE American Bridge Company, Pittsburgh, Pa., with a price of \$54,000 for four barges without cargo boxes and \$215,250 for fifteen barges with cargo boxes, submitted the lowest price for the construction and delivery of nineteen of the boats at the opening of tenders by the United States

Engineer Office, Louisville, Ky., on September 11. The proposed vessels are to have a length of 110 feet; beam, 26 feet; depth 6½ feet.

The prices submitted, upon which no decision has been announced as yet, are as follows:

	No. 1, American Bridge Co., Pittsburgh, Pa.	No. 2, Nashville Bridge Co., Nashville, Tenn.	No. 3, Dravo Contracting Co., Pittsburgh, Pa.	No. 4, Chas. Hegewald Co., New Albany, Ind.	No. 5, Howard Shipyard & Dock Co., Jeffersonville, Ind.	No. 6, Midland Barge Co., Midland, Pa.	No. 7, Penn Bridge Co., Beaver Falls, Pa.	No. 8, Riter-Conley Co., Pittsburgh, Pa.
Regular Proposal—								
4 Steel barges, lump sum.	\$54,000	\$96,160	\$72,800	.....	.....	\$80,000	\$76,240	\$61,120
15 Steel barges, lump sum.	215,250	387,600	287,250	.....	.....	318,000	302,830	243,450
Alternate Proposal No. 1—								
15 Steel barges, lump sum.	215,250	390,600	287,250	.....	.....	318,000	317,830	243,750
Alternate Proposal No. 2—								
4 Steel barges, lump sum.	54,000	96,960	72,800	.....	.....	80,000	.....	61,200
10 Steel barges, lump sum.	143,500	260,400	191,500	.....	.....	212,000	.....	162,500
Alternate Proposal No. 3—								
10 Steel barges, lump sum.	143,500	264,400	194,000	.....	.....	212,000	.....	163,700
Alternate Proposal No. 4—								
4 Steel barges, lump sum.	.....	98,960	74,320	.....	.....	80,000	.....	63,720
5 Steel barges, lump sum.	.....	132,700	97,800	.....	.....	107,000	.....	84,600
Alternate Proposal No. 5—								
5 Steel barges, lump sum.	.....	136,200	100,000	.....	.....	.....	.....	91,650
Alternate Proposal No. 6—								
4 Steel barges, lump sum. *	.....	103,700	76,880	69,990	71,670	.....	83,300	71,720

*If barges are delivered afloat at Ambridge, Pa., sum of \$350 per barge will be deducted from above price.

Todd Yard is Low
Bidder for 6-Barge
Construction Job

THE Tacoma plant of the Todd Shipbuilding Corporation, submitted the lowest bid for the construction of six steel barges at the opening of proposals by the United States Engineer Office, Portland, Ore., on September 7. The Todd figure was \$114,900.

The proposed boats are to have a length of 120 feet, 34 feet beam and a depth of 7 feet 6 inches, delivery to be at Linton, Ore. The tenders were:

Todd (Tacoma)	\$114,900
Smith & Watson Works.....	155,700
Albina Marine Iron Works.....	179,850
Seattle Boiler Works.....	180,000
Penn Bridge Company.....	181,200
W. B. Kyle.....	193,200
Bethlehem S. B. Corporation.....	297,710

Ford to Build Million Dollar
Plant With Docks

It is reported from Louisville, Ky., that Mr. J. L. McPhee, manager of the Louisville Ford Company's assembly plant, has announced that the Ford Company will build a new \$1,000,000 assembly plant on the Ohio River in the suburbs of Louisville. Docks and terminal facilities at this plant will be erected as the Ford Motor Company plans to use the river to a large extent in its shipments.

They were afterwards entertained at luncheon at the Whitehall Club. During the afternoon they visited the White Star Liner *Olympic* and on the following day were shown around the city of New York.

Bids Received
for Six Derricks
at Louisville, Ky.

THE United States Engineer office, Louisville, Ky., received sealed proposals until 2 P. M., central time, September 29, for furnishing and delivering two to six steel derrick boat hulls. The derricks are to include all sheaves, pins, collars, clevises, rollers, boom sheaves, blocks, etc., but not wire rope. The booms are to have a length of 65 feet and the bull wheels will have a diameter of 16 feet.

The proposed hulls are to have a length between perpendiculars of 74 feet 8 inches; beam 34 feet 8 inches; depth at gunwale 5 feet. Delivery is to be made at U. S. Siding, Louisville and Portland Canal, Louisville, Ky. It is estimated that the boats will cost about \$5,000 each.

Proposals Open October 1 for
Marine Boiler, Stack
and Fixtures

Sealed proposals will be received until 11 A. M., October 1, by the United States Engineer Office, Montgomery, Ala., for furnishing one steam boiler, with fixtures, stack, etc., for the U. S. Dredge *Upatoi*, at Columbus, Ga.

The boiler is to be of the Scotch marine, water-back type, designed for a working pressure of 200 pounds, to have not less than 1,200 square feet of effective heating surface and not less than 37 square feet of grate area. The furnace is to be of the Morrison suspension type. The stack to be furnished is to be of suitable diameter, 35 feet in length and supplied in two sections. It is to be built of 14-gage steel.

Shipping Board Owns 1,334 Ships Valued at \$226,733,315; Only 416 Are in Operation or Ready for Delivery

CHAIRMAN EDWARD P. FARLEY, of the Shipping Board, has made public the figures on the merchant fleet owned by the Board showing the number and kind of ships composing the Government fleet, together with their valuation.

The statement, as of September 8, 1923, shows that the Board owns 1,334 ships, the total value of which is \$226,733,315. Of these ships 416 are in operation or ready for spot delivery, with 882 laid up, exclusive of 35 tugs laid up and in operation.

The value of the ships in operation or ready for spot delivery is \$137,311,940; the value of the laid up ships is \$87,906,375. The value of the tugs is \$1,515,000.

The total value of the fleet as of July 1, 1923, was \$227,732,615. Since July 1 the Board has sold six ships at a total sale price of \$999,300.

The following table shows the various classes of vessels in possession of the Board, with their valuation:

Recapitulation of Classification and Valuation of Fleet as a Whole

	Spt or Operating	Laid Up
Cargo	\$81,390,410 (365)	\$75,568,296 (802)
Tankers	8,608,230 (19)	5,558,670 (26)
Refrigerators..	923,300 (2)	3,098,136 (12)
Concrete tank- ers		175,000 (7)
Concrete cargo Class "F" usa- ble		7,000 (2)
Damaged and obsolete		374,773 (5)
Transport (ca- ble)		474,500 (19)
Transport type "B"		25,000 (1)
Passengers ...	46,390,000 (30)	1,225,000 (5)
		1,400,000 (3)
Total	\$137,311,940 (416)	\$87,906,375 (882)

Tug—laid up and operating..	\$1,515,000
Spt or operating.....	\$137,311,940 (416)
Laid up	87,906,375 (882)
Tugs	1,515,000 (36)
	\$226,733,315 (1334)
Sold since July 1.....	999,300 (6)
Total value of fleet as of July 1, 1923	\$227,732,615 (1340)

Company Formed to Manufac- ture Blowers

The Connecticut Blower Corporation, Hartford, Conn., has been incorporated under the laws of Delaware, with a capital of \$250,000. M. E. Keeney is president, C. H. Keeney, treasurer, and C. E. Keeney, secretary.

The new company has taken over the International Blower Company and the Hartford Sheet Metal Works. The products manufactured and installed are of a large variety, such as blowers and exhaust fans, blower systems of all kinds, dust collecting systems, exhaust systems, ventilating systems, etc.

New Linde Warehouse Established

A new warehouse has been established by The Linde Air Products Company at the B. & M. Wharf, Portland, Maine, in order to give even better service to users of Linde Oxygen and Prest-O-Lite Acetylene in the state of Maine. S. W. Jordan, 11 Exchange street, will be in charge of distribution.

Propeller Club to Act as Entertain- ment Committee for Marine Congress

THE Propeller Club of the Port of New York has accepted the invitation of the American Marine Association to act as the official Marine Congress Entertainment Committee. The Congress is to be held at the Waldorf-Astoria Hotel, November 5-10, and the Entertainment Committee will function for the benefit of the Marine Exposition, as well as the Congress, both events taking place during the same week.

In this connection, the Propeller Club has appointed a Central Committee, the members of which will be chairmen of sub-committees, as follows: W. Z. Gardner, chairman; Norris R. Sibley, hotel committee; Chester Roe, transportation committee; Nelson S. Tobey, ship inspections committee; E. M. Roberts, exposition committee; H. W. Parsons, entertainment committee. They will assist the delegates in obtaining hotel reservations, best methods of transportation, sight seeing tours around the world's greatest port, inspections of the various types of ships, including passenger, freight and war vessels, which will be placed at their disposal during Marine Week.



Marine Congress
Official Badge

Over a Million and a Half to Be Spent in San Francisco Bay

THE sum of \$1,674,000 will be expended in the near future on improvements to harbors and channels around San Francisco Bay by the Federal Government, according to an announcement by Col. Herbert Deakney, U. S. Army Engineer Corps.

The main channel to San Francisco Bay is 36 feet at its greatest depth, and at some places, 30 feet. The plan of the army engineers is to make a 43 foot depth in all places and a width of 2,000 feet.

Radio Equipment for Nantucket Shoals Lightship

Commissioner of Lighthouses G. R. Putnam has informed the Philadelphia Maritime Exchange that the new Nantucket Shoals light vessel will be equipped with radio fog signaling apparatus and that the candlepower of the light will be increased to three thousand.

The radio signal will consist of a radio broadcast of four dashes every thirty seconds, followed by a silent period of twenty-five seconds, the signal to be transmitted on three hundred kilo cycle frequency, which is a one-thousand meter radio wave.

Except as stated, the new vessel will have the same characteristics and signals as the old vessel.

TRADE PUBLICATIONS

MONEL METAL.—A catalog on the uses of monel metal has been received from G. and J. Weir, Ltd., Cathcart, Glasgow. Among other things, this catalog calls special attention to diagrams showing the strength at high temperatures on monel and various other metals. Another special point brought out in the book is the resistance of monel metal to corrosion and its uses in a variety of industries.

CLEANING BOILER TUBES.—In a pamphlet recently issued, the Heine Boiler Company, of St. Louis, states that tests have shown that one-fiftieth of an inch of scale deposited on a steel plate will reduce the rate of heat conduction 60 to 75 percent. The means provided in Heine boilers for maintaining clean tubes are described in this pamphlet, and details of the Bayer soot blower, which is furnished with every Heine boiler, are included.

THERMIT RAIL WELDING.—The Metal & Thermit Corporation, New York, has issued a new thermit rail welding pamphlet, which brings up to date the whole subject of thermit rail welding to cover the many recent improvements in economy and efficiency.

HISTORY OF THE NIPPON YUSEN KAISHA.—The Nippon Yusen Kaisha, Tokyo, Japan, which came into existence in 1885 as a result of the amalgamation of two Japanese shipping concerns, has presented in booklet form a short but complete history of the line which is to a great extent the history of the shipping industry of Japan. This book is written in English for special distribution in this country and England. It offers an excellent means of becoming acquainted with the progress of the industry in the Eastern countries.

PORTABLE ELECTRIC TOOLS.—A miniature catalog sent out by the Hisey-Wolf Machine Company, Cincinnati, Ohio, briefly describes the complete line (112 different types and sizes of tools) of Hisey electric products. This book has been prepared principally for dealers and agents who know the value or necessity of placing complete condensed practical information in the hands of all customers and prospects.

ELECTRICAL FIXTURES.—Details of switches and plug receptacle housings and other types of conduits in a great variety of forms for special usage in both land and marine practice are listed in an illustrated bulletin sent out by the Crouse-Hinds Company, Syracuse, N. Y. QE housings are made to in close snap switches, key switches, attachment plug receptacles and 125, 250 and 600 volt Crouse-Hinds plug receptacles. Further information relative to various combinations of bodies and housings will be furnished upon request by the company.

COMMUTATOR TRUING DEVICE.—Several leaflets illustrating and describing the Jordan commutator truing device have been made available by Jordan Brothers, Inc., 74 Beekman street, New York. It is stated that this device supplies the only correct method of grinding commutators or slip rings in their own bearings, leaving them true and smooth. The device grinds the commutator through the medium of an abrasive wheel, is applied quickly and easily adjusted without special skill required of the operator and is used equally well on flint mica or under-cut commutators without bridging copper across the mica. No interruption of service is necessary, for machine may carry their load while being ground.

Foreign Shipping and Shipbuilding Activities

British Shipping Exhibition Repays Visit to Olympia

By James Swan*

LONDON, Eng. (Special).—The Shipping Exhibition now being held at the Olympia, London, is full of interest for all who are even remotely connected with the building and operation of ships. One is at once struck by the neatness and good arrangement of the various exhibits, as well as the very large range of subjects covered by them.

NUMEROUS AUXILIARIES EXHIBITED

The exhibit of auxiliary machinery of various kinds is especially comprehensive, and one is particularly impressed by the old and substantial character of the various machines. The British surely have earned to put material "where it does most good."

In this class were particularly noted the Worthington Pump Company, James Howden and Company, Wallsend Slipway and Engineering Company (oil burning equipment), The Williams-Janney hydraulic speed gear (similar to the American Waterbury speed gear) and the Kirkaldy evaporators, etc.

Other interesting exhibits deserving notice were Wales and Dove's bitumastic enamel, etc., the Parsons Turbine Company, Welinavit, Brown-Lennox Chain Company, Perry gyro compass and a large number of electric welding machines of various types, as well as wireless telegraphs and similar apparatus.

These are a few of the exhibits which were especially noticed—there are dozens of others of equal interest, but too numerous to mention in a passing notice.

MOTORBOAT SHOW IN THE ANNEX

In the annex, a new building, there is a large collection of motorboats and gasoline (or petrol) engines. Some of the hulls are most beautifully constructed and the large exhibit of engines by Thornycroft is particularly fine.

Taken altogether, the exhibition is most decidedly worth visiting, and the substantial and wholesome character of almost everything shown leaves one with a good impression of the character of materials and outfits which enter into the construction of British vessels.

*Editor of MARINE ENGINEERING AND SHIPPING

Australian Government Shipping Venture Costly

THE financial statement of the Australian Commonwealth's fleet of merchant ships, as summarized by the Transportation Division of the Department of Commerce, gives the present book value of the fleet as £12,766,588, but the current market appraisal of the fleet is put at £4,718,150. The account of Government operation shows a net loss of £493,271. In addition, the Government also lost £2,300,000 on its contract for 14 American wooden steamers, thus the total losses on the Australian Government's venture in shipbuilding and shipowning are close to £11,000,000.

Financial Aid for Shipowners Planned in France—Eight New Liners Being Built

By Our Paris Correspondent

A QUESTION which is at present stirring much interest both in shipping and parliamentary circles is that relative to the institution of a private banking company which should make advances of money to shipowners in order to enable them to hold out until the prevailing difficulties in shipping affairs have disappeared. The necessity for such an organization—called the Credit Maritime—has been echoed for months in French papers.

Several interesting developments have taken place in that respect in the course of the last few weeks. When the Government had ascertained that the proposed organization would meet with the unanimous approval of all concerned in shipowning in this country, they appointed a committee, the Commission Interministerielle, which was intrusted with the task of investigating the question and making suggestions towards the realization of the scheme. That committee has recently issued its report.

The most important innovation to be pointed out in connection with the program of the Credit Maritime lies in the fact that not only the real value of the vessels owned by the firm concerned should be taken as security for loans made, but also the personal guarantee of that firm; that is to say, its financial and traffic prospects, the conditions of its management, the efficiency of its

fleet, etc., all of which are considerations which could not be taken into account as securities in respect of loans made on mortgages. The main question now is the constitution of the initial capital of the undertaking.

MESSAGERIES MARITIMES BUILDING EIGHT PASSENGER VESSELS

The Messageries Maritimes, the big French steamship company which is running regular services between France, the Far East, Madagascar and the Mediterranean countries, has just decided on the names which are to be given to the new vessels under construction to its account. It is noteworthy in passing that this company has the largest building program in France, the reason being that the firm has accepted the control of the Government in exchange for a full financial support.

At present this company has no less than 8 passenger vessels under construction to its account. The *Aramis*, of 20,300 tons displacement, is being completed at the yards of the Chantiers de la Gironde at Bordeaux. Her propelling machinery consists of 2 steam turbines of the Schneider-Zoelly type, each driving one propeller shaft through double reduction gearing, the total power developed being about 8,000 horsepower. The same yard is also building a sister ship which is to be named *D'Artaignan*.

To the account of the Messageries Maritimes, also, there is under construction at the yards of the Société Provençale de Constructions Navales at La Ciotat, near Toulon, three passenger vessels. Two of small size (the *Champollion* and the *Mariette*) will be placed in service on the Mediterranean lines of the company, while the third one, the *Leconte de Lisle*, of 15,100 tons displacement, will be run on the Indian Ocean line. A sister ship to the *Leconte de Lisle*, which is to be named *Explorateur Granddier*, is under construction at the yards of the Chantiers et Ateliers de Saint-Nazaire-Penhoet.

In addition to these 6 vessels, the Messageries Maritimes has under construction in German yards two passenger vessels of the *Aramis* type, which will be run with the *Aramis* and the *D'Artaignan* on the Marseilles-China line. They have been ordered from German yards in accordance with the Versailles Treaty.

installed would be 600 francs for each twenty-four-hour period, the price of the oil today being 400 francs per ton. This is the price quoted for the fishing shipowners, who, it is estimated, would buy quantities of 50 or 100 tons at a time. This price is quoted with the Franco-American rate of exchange at 14.96 francs to the dollar.

With coal at 152 francs per ton, the steam-propelled fishing vessel of 500 tons horsepower consumes daily about 10 tons. This calls for an outlay by the owner of 1,520 francs daily for coal alone. And with a bunker capacity of 300 tons, the vessel can remain at sea for only thirty days.

First Heavy Oil Motor Vessel for French Fishing Fleets

A STEP which portends a complete revolution of the French fishing industry and the opening of an important market for internal combustion, heavy oil motors, of the Diesel or semi-Diesel type, is being taken at Boulogne-sur-Mer, where the first installation of this kind is being made on one of the largest trawlers of the fishing fleet, according to a special report to the Department of Commerce. The event is heralded as the death signal for the coal-burning steam type of vessel, which is now exclusively employed in the French fishing industry.

Having experienced two years of discouraging losses—the receipts of 1921 and 1922 having been insufficient to meet the expenses of operation—the owners of the fishing fleet vessels find themselves forced to discover a means whereby their ships may put to sea and return without spending too much money for fuel. This situation, which becomes more acute daily, seems bound to aid in the development and installation of the new system of motor propulsion on the vessels of the fleet.

The motor being installed is a "Chaléassière" of 500 horsepower, which burns mazout. It is a simplified type of Diesel, and it is estimated that its maximum consumption will be one and one-half tons of mazout for each twenty-four hours.

Predicating estimates on the consumption of one and one-half tons of mazout a day, the cost of operation of the motor being

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPBUILDING AND REPAIRS

Engine Repairs, Savannah, Ga.—The Shipping Board steamer Cripple Creek is at Savannah for repairs to her engines.

Steamer Drydocked, Cleveland, O.—Steamer W. H. Donner, damaged by grounding recently, has been placed in drydock at Cleveland for repairs.

Overhauling of Steamer, San Pedro, Cal.—The steamer American, damaged to the extent of \$210,000 by fire at sea, has been taken to San Pedro for overhauling.

Vessels Drydocked, Chester, Pa.—The steamships Sunoil and J. N. Pew, of the Sun Company, have been drydocked for thorough overhauling at the Chester plant.

Ship Work, Mobile, Ala.—The Alabama Dry Dock and Shipbuilding Company, Mobile, Ala., is completing repairs to the steamship Normania and also the Shenandoah.

Damaged Steamer Repairs, Cleveland, O.—The damaged steamer J. S. Ashley, which recently grounded on Crab Island shoal, Great Lakes, has been taken to Cleveland for repairs.

Ferry Repairs, Jacksonville, Fla.—The ferryboat Dural, which plies between Jacksonville and South Jacksonville, went to the Gibbs drydock recently for repairs to a broken propeller shaft.

Japanese Steamer Drydocked, Portland, Ore.—The Japanese steamer Yonan Maru was recently taken to Portland for drydocking and repairs after having grounded at the mouth of the Columbia River.

Diesel Engine Installations, Pacific Coast.—A 110-horsepower Diesel engine is being installed in the motorship Sudan for the Daniel Contracting Company by the Pacific Diesel Engine Company, of Oakland, Cal.

Hull Damage Repairs, Beaumont, Tex.—Vogemann-Goudriann Company's steamer Deutschfeld is at Beaumont to have her hull, which was damaged badly when it struck a submerged anchor in that harbor, repaired.

Ferryboat Launched, Wilmington, Del.—The Pusey & Jones shipyard in Wilmington has launched the ferryboat Ocean City, the second all-steel ferryboat built this summer for the Philadelphia and Reading Railway.

Tanker at Navy Yard, Norfolk.—The naval tanker U. S. S. Trinity, which recently sailed from Baytown, Tex., for Hampton Roads with a cargo of oil, has been taken to the navy yard for drydocking and repairs.

Miscellaneous Repairs, Chester, Pa.—The Sun Shipbuilding and Drydock Company, of Chester, Pa., has been awarded the contracts for miscellaneous repairs and painting the steamships Hesporos and Fredness.

Miscellaneous Work, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation, San Francisco, has been awarded the contract for making repairs to stern, frame and bottoms of the American Hawaiian freighter Dakotan.

Steamer Docked, Baltimore, Md.—The steamer Robin Adair, operated by Norton, Lilly Company, on their west coast route, was drydocked by the Maryland Dry Dock Company for attention previous to loading for the west coast.

Engine Room Repairs, Mobile, Ala.—The steamship Stavangeren is at the yards of the Alabama Dry Dock and Shipbuilding Company for engine room repairs and also to have 100 grate bars, cast in the yard's foundry, installed.

Contract Awarded, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation, with a price of \$51,240 and twenty-eight days (low bidder), received the contract for generally overhauling the United States transport Thomas.

Towboat Awarded, Marietta, O.—The Marietta Manufacturing Company of Marietta, O., has been awarded a contract for a towboat, 135 feet by 30 feet, for the Vesta Coal Company, of Pittsburgh. The boat will be for use on the Ohio river.

Shipyard Activities, West Coast.—The Shipping Board vessel West Mahwah is at the Hanlon yards for a new stern frame; bids have been tendered for the reconditioning of the steamers Castletown and Castlepoint, by the McCormick Steamship Line.

Bids Rejected, West Coast.—Bids submitted for repairs on the steamer West Carmago, by California shipyard companies, have been rejected. The prices submitted were: Moore, \$1,176; Hanlon Drydock Co., \$1,181.50, and the Bethlehem yard, \$1,186.50.

Repainting, etc., Los Angeles, Cal.—The liner Dorothy Alexander has been shifted to the yard of the Los Angeles Shipbuilding and Drydock Company for repainting and minor overhauling. The Ruth Alexander has also been taken to the same yard for repairs.

Work at Charleston Yard.—The Shipping Board steamship Western Wave, one of the idle fleet in the Ashley river, has been removed to the Charleston Drydock & Machine Company works for overhauling. The dredge Savannah, which is engaged in harbor work, went to the same yard for numerous repairs.

Cramp Shipyard Activities, Philadelphia, Pa.—The Cramp Shipbuilding and Drydock Company has completed repairs on the Black Diamond Steamship Company's steamship Anaconda and is now making miscellaneous repairs to the United Fruit Company's steamship Runa.

Barge Contract, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, of Mobile, has received a contract for the construction of three steel barges for the Tennessee Coal & Iron Company, a subsidiary of the U. S. Steel Corporation. Work will be started in the near future.

Steel Boom Contract.—The contract for two steel booms, bids for which were opened by the U. S. Engineer Office, Louisville, Ky., on August 27, has been awarded to the Clyde Iron Works, Duluth, Minn., at a price of \$1,580, delivery to be made in 50 days. Ten bids were received, ranging up to \$3,300.

Low Bidder, San Francisco, Cal.—At the opening of tenders for repairs to the Pacific Mail liner Colombia, the General Engineering Company was low bidder for the engine work on the vessel, with a price of \$433. The same company was also low bidder on repairs to the Pacific Mail steamer Corinto.

Todd Equipment on Vessel, Newport News, Va.—The Newport News Shipbuilding and Dry Dock Company, at whose plant in Virginia the President Buchanan is being reconditioned for the Shipping Board, has awarded a contract to the Todd Shipyards Corporation for the installation of Todd burners, fronts and equipment.

Repairs Bids, New York.—The Morse Dry Dock & Repair Company was the low bidder for general repair work on the steamship Luceric, when tenders were opened by Holder, Weir & Boyd, on September 4. The prices were: Morse, \$1,015; Alderton, \$1,100; Staten Island Shipbuilding Company, \$1,122; Robins, \$1,280, and New York Harbor, \$1,740.

Cleaning and Painting, Portland, Ore.—The steamer West Cayote, operated by the Columbia-Pacific Shipping Company in the oriental service for the Shipping Board, has been placed on the St. Johns drydock plant of the Port of Portland,

for cleaning and painting her hull. The steamer West Kader is also on the same docks for voyage repairs.

Will Remodel Tug, Jacksonville, Fla.—Announcement is made by Captain A. B. Potter, of the Jacksonville Forwarding Company, that the tug General D. B. Stanley has been purchased from Norfolk Shipping interests and that the steamer would probably be remodelled. She has a length of 110 feet and is equipped with about 600-horsepower engines.

Shipyard Activities, West Coast.—The Bethlehem Shipbuilding Corporation has been awarded the following work: Steamer West Sequana, of Struthers & Barry fleet, for general overhauling; tanker L. Placencia, repairs to damaged bottom. The company has completed the work on the tanker Job D. Archbold, which consisted of replacing and repairing plates damaged in grounding.

Tug Launched, Portland, Ore.—The tug James W., Diesel driven, to join the Shaver Transportation Company's line of towboats, was launched recently from the plant of the Portland Shipbuilding Company. She has a tunnel hull 90 feet long, 22 feet beam, and depth of five feet. A 300-horsepower Atlas Imperial engine has been installed. The company expects to use her in harbor work.

Low Bidder for Work, Los Angeles, Cal.—At the opening of bids by the Shipping Board for removing turbines and installing reciprocating engines in its vessel Miskianza, the Los Angeles Shipbuilding and Drydock Company was low bidder at \$109,820. The other bids were: Bethlehem Shipbuilding Corporation, \$113,185; Moore Drydock Company, \$113,375, and the United Engineering Works, with a bid of \$123,642.

Repairs at Moore Yard, Oakland, Cal.—The Moore Drydock Company has received the contract for repairs to the hull of the Norwegian tanker So Joaquin, owned by Wilhelm Wilhemson, but under charter to the Union Coal Company. The damage was caused by grounding some time ago. The contract was awarded at a price of \$18,735 and ten days, the Bethlehem Shipbuilding Corporation tendering a bid of \$19,875 and ten days. Besides the work, eight new plates will be installed. The same yard is storing a new tailshaft for emergency services in the tanker Sylvan Arrow.

Ship Work, Oakland, Cal.—The Hanlon Shipyard has showed marked activity recently and has received the following vessels for miscellaneous repairs: steamer Nome City, drydocking and general overhauling, including the installation of a new lead sleeve, new tailshaft, bronze wheel, and renewal of her stem and canvassing of her deck lumber carrier Mukilteo, motorship Lassen, steamer schooner Horace X. Baxter, steamer Northland lightship No. 83, ship Monongahela, steamer Vinland and barkentine Monitor for drydocking and general overhauling. To have her decks calked and for the installation of new foremast and bowsprit, the barkentine Mary Winkelman is on drydock at the same yards.

Toss of Coin Decides Contract, San Francisco, Cal.—A contract involving more than \$3,000 was settled between two officials of San Francisco shipyard firms by the toss of a coin. The contract called for work on the United States transport Grant. When the tenders were received it was found that there was a misunderstanding in the amount of work to be covered in the bid, the two companies bidding on the full work being the General Engineering Company and the United Engineering Company. The work on the transport had to be finished as quickly as possible and therefore Frank Fox, chief engineer for the General Engineering Company, called up Arnes, of the United Engineering Works, who suggested that a coin be tossed with the United Engineering Company. The half-dollars were flipped with the result that the United Engineering Works won.

PORT IMPROVEMENTS

Harbor Improvements, Berkeley, Cal.—Alameda company plans election to vote on \$50,000-\$100,000 bonds for harbor improvements.

Elevator, Valley View, Tex.—Whaley Mill & Elevator Company is having plans prepared for an elevator, the cost of which will exceed \$60,000.

Seawall and Yacht Basin, Sarasota, Fla.—H. F. Atkinson and associates, Miami, plan seawall and yacht basin at Sarasota to cost \$100,000. Engineer not announced.

Pier, Philadelphia, Pa.—Department of Wharves, Docks & Ferries awarded the contract for completing Porter Street Pier #4 to Snare Corporation, 324 Chestnut Street. \$500,000.

River Terminal, Cincinnati, Ohio.—Cincinnati River-Rail Transfer Company, Front and Harriet streets, plans river freight terminal, 50,000 tons' capacity. \$50,000-\$75,000.

Wharf, Pembroke, Ont.—The Department of Public Works, Parliament Building, Ottawa, will soon let bids for a wharf to cost \$125,000. K. M. Ameron, acting chief engineer.

Levee, Sacramento, Cal.—The contract for the removal of Y street levee, 144,744 cubic yards earth excavation, has been awarded to Byrne, Yost & Reister, 2512 N street. \$60,049.

Wharf, Harpor, B. C.—Sealed proposals will be received by R. C. Desrochers, Secretary of the Department of Public Works, Ottawa, until October for a floating wharf at Harpor.

Wharf, Sorel, Que.—Bids were received on September 4 by R. C. Desrochers, secretary, Department of Public Works, Ottawa, Ont., for reconstructing concrete high level wharf here.

Dam on Colorado River, Bronte, Tex.—Coke Run's Water Improvement District 1 plans dam on Colorado River, ditches, laterals, etc. \$4,500,000. \$5,000,000. C. C. Holder, Bronte, engineer.

Grain Elevator, Chippewa Falls, Wis.—Farmers Produce Company, c/o F. W. Anderson, mgr., 15 1st Central street, will build 2-story, brick, plain foundation by day labor. \$40,000. Private plans.

Dredging, Los Angeles, Cal.—Board of Harbor Commissioners awarded the contract for dredging 0,000 cubic yards fronting wharves to the United Dredging Company, Central Building. \$0.244 per cubic yard.

Dredging, Newport, Cal.—Parkinson Syndicate interests have awarded the contract for dredging channel in vicinity of county turning basin to Los Angeles Dredging Company, Seaside Park, Long beach, \$500,000.

Bids for Canal, Port Colborne, Ont.—Dominion Department of Railways & Canals, Parliament Buildings, Ottawa, will soon take bids for Port Colborne section of Welland Canal. \$10,000. W. Bowden, chief engineer.

Hydraulic Dredging, Port Arthur, Ont.—Dominion Canada, Department of Public Works, Parliament Buildings, Ottawa, awarded the contract for hydraulic dredging in Port Arthur harbor to Canadian Dredging Company, Midland. \$246,920.

Breakwater, Toronto, Ont.—The Department of Public Works, Parliament Buildings, Ottawa, Ont., awarded the contract for 4,440 lineal feet of concrete breakwater on the foundation, Toronto, to Miller & Sons, Lumsden Building. \$1,030,000.

Dyke, New Westminster, B. C.—South Westminster Dyking Commissioners, Cloverdale, awarded contract for a 4½-mile earth dyke along Fraser river, opposite New Westminster, to A. B. Palmer Company, 736 Granville Street, Vancouver. \$1,000.

Retaining Walls, etc., Ohio.—P. R. Murray, director of Public Works, Hartman Building, Columbus, will soon take bids for repairs to concrete and masonry walls, also building new retaining walls, at Lake Erie in Fairfield and Licking Counties. \$1,000.

Dikes, Levee Work, etc., Shreveport, La.—The city of Shreveport is having preliminary plans and surveys made for reinforced-concrete dikes, dikes and levee work. \$400,000 to \$450,000. E. Smith, Railway Exchange Building, St. Louis, engineer.

Bids Rejected, Clarksdale, Miss.—The Board of Levee Commissioners, Yazoo, Mississippi Delta, rejected bids for enlarging 5-mile Ward Lake levee containing 10,000 cubic yards of topping, 75,000 cubic yards of barquette enlargement. W. L. Head, Clarksdale, engineer.

Canals, etc., Newport, Ark.—Cache River Drainage District is making plans for drainage ditches, canals, etc., in Jackson and Poinsett Counties. \$1,000,000. Morgan Engineering Company, Goodwin Inst., Memphis, Tenn., and Bowman Engineering Company, Newport, engineers.

Wharf and Warehouse, New Orleans, La.—Board of Port Commissioners, New Court Building, is having plans prepared for a substructure and superstructure concrete wharf, pile foundation, also one-story steel and metal warehouse, 400 to 1,600 feet long, 150 feet wide. \$500,000.

Wharves, Houston, Tex.—The contract for 1,720 feet of wharves has been awarded by the Harris County Navigation District, in three sections, as follows, to Doultt & Williams, Carter Building: reinforced-concrete structure, concrete piling, \$669,000, and timber piling, \$94,000.

Levee, Yazoo City, Miss.—The Clark Construction Company, of Memphis, Tenn., has been awarded a contract by the Rocky Bayou Levee District for a levee on the east bank of Yazoo River, north bank O'Neal's Creek and south bank of Short Creek, 2 canals, etc., at a price of \$150,000.

Cresosoting Lumber, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, at their office, Suite 200, New Orleans Court Building, on September 6, for cresosoting of second hand lumber furnished by the Board. Requisition E. D. 13912.

Coal Pier Under Way, Norfolk, Va.—The construction of steel framing of the new \$3,000,000 coal pier of the Virginian Railway at its Sewells Point has begun, the foundation having been completed. The contract for the steel framing has been placed with the Bethlehem Steel Company.

Contract Awarded, Chico, Cal.—Butte Creek Drainage District awarded the contract for cleaning out Butte Creek to California Dredging Company, Hobart Building, San Francisco. 80,000 yards excavation in outlet drains at \$0.20 per yard and 20,000 yards excavation in drainage canal, \$0.25.

Excavation, Riverhead, N. Y.—Bids were received on September 27 by the Salt Water Bays Commission at the office of the State Engineer and Surveyor, Telephone Building, Albany, for excavating channel connecting Moriches, Quantuck, Shinnecock and Peconic Bays, Suffolk County. D. B. LaDu, chairman.

Wharf Extension, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Court Building, on September 13, for clearing the site for an extension of the Poland Street Wharf on the site of the burned Army Supply Base Wharf. J. H. Walsh, general manager. Requisition E. D. 13789.

Grain Elevator, Houston, Tex.—Harris County Navigation District is having plans prepared for a concrete grain elevator, 900-foot frontage on the ship channel, headhouse, tank storage and grain carriers, initial capacity 1,000,000 bushels, ultimately 6,000,000 bushels. \$1,000,000. E. A. Tucker, Court House, engineer. J. Metcalf & Company, 108 South La Salle Street, Chicago, consulting engineer.

GOVERNMENT WORK

Generators, etc., Washington, D. C.—U. S. Engineer rejected bids for dredging in Scuppernong River.

Breakwater Gulfport, Miss.—U. S. Engineer plans 1,400-foot breakwater at ship basin here. E. North, U. S. E. C., Mobile, Ala., engineer in charge.

Dredging, Honolulu, H. T.—Specification 4891—The Bureau of Yards and Docks, Navy Department, Washington, D. C., plans dredging at Naval Wharf here.

Steel Barges, Portland, Ore.—Sealed proposals were received by the United States Engineer Office, 2nd District, Portland, Ore., on September 7, for six, 120-foot by 34 feet by 7 feet 6 inches, steel barges.

Lock, Pittsburgh, Pa.—Sealed proposals were received on August 23 at the U. S. Engineer Office, Pittsburgh, for constructing Lock 7, Monongahela River.

Levee, Kennett, Mo.—St. Francis Levee District plans rebuilding 12-mile levee, 1,000,000 cubic yards dry earth excavation. J. D. Mitchell, Puxico, engineer.

Dredging, Galveston, Tex.—U. S. Engineer, Galveston, awarded the contract for dredging in Texas City Channel to J. Jacobson, 2311½ Avenue C, \$24,780.

Dredging, Boston, Mass.—Sealed proposals were received on August 30, at the office of the U. S. Engineer, Custom House, for dredging in Beverly Harbor.

Dredging, Oakland, Cal.—The U. S. Engineer Office, San Francisco, Cal., received sealed proposals on September 6, 1923, for dredging in Oakland Harbor, Cal.

Rock Removal, Seattle, Wash.—Sealed proposals were received on September 1, 1923, for rock removal in Willapa River, Wash., by the U. S. Engineer Office.

Dredging, Baltimore, Md.—Sealed proposals were received by U. S. Engineer Office, on August 13, for dredging 2,584,700 cubic yards from entrance of channel, here.

Dredging, Petaluma Creek, Cal.—Sealed proposals were received by the U. S. Engineer Office, San Francisco, Cal., on August 30, for dredging in Petaluma Creek, Cal.

Dredging, Port Isabel, Tex.—The State and Federal Government has awarded the contract for dredging Port Isabel Channel to an 18-foot depth, to J. Jacobson, Galveston. \$314,000.

Riprap Stone, Baltimore, Md.—Bids were received on August 15 by the Superintendent of Lighthouses for furnishing and placing 2,500 tons of riprap stone at Lighthouse Stations, 5th District.

Breakwater, Marquette, Mich.—U. S. Engineer, Custom House, Duluth, Minn., awarded the contract for repairs to breakwater at Marquette to Tidouche Company, Detour, Mich., at \$62,379.

Stone, Harbor Beach, Mich.—U. S. Engineer 337 Federal Building, Detroit, received no bids on August 16 for furnishing and placing 10,000 tons of stone on breakwater here. Will readvertise.

Dredging, New York, N. Y.—Sealed proposals were received on August 9 at the U. S. Engineer Office, 616 Army Building, for dredging and rock removal in Area 2, New York and New Jersey Channels.

Harbor Improvements, Charlotte Harbor, Fla.—The War Department has announced an allotment for river and harbor maintenance and improvement work, including \$20,000 for Charlotte Harbor, Fla.

Bulkhead, Far Rockaway, N. Y.—Atlantic Beach Associates, Inc., plans 1,500 feet of bulkhead, on Far Rockaway Bay. J. R. Spelman, 405 Lexington avenue, New York, consulting and supervising engineer.

Dredging, Far Rockaway, N. Y.—Atlantic Beach Associates, Inc., plans the dredging of 600,000 cubic yard sand fill. J. R. Spelman, 405 Lexington avenue, New York City, consulting and supervising engineer.

Widening Channel, Detroit, Mich.—J. B. Breyman, 2052 Robinwood avenue, Toledo, Ohio, was awarded the contract for widening Livingston Channel, Detroit River, by U. S. Engineer Office, \$293,780.

Removal of Wreck, Beaufort, N. C.—Sealed proposals, in duplicate, were received at the U. S. Engineer Office, Wilmington, N. C., on August 24, for removing wreck of tug Jugo from the ocean bar at Beaufort Inlet, N. C.

Contract Awarded, Baltimore, Md.—U. S. Engineer Office awarded the contract for dredging in Queenstown Harbor, Md., to Calkins Dredging Company, Inc., 604 Bankers Trust Building, Norfolk, Va., at a price of \$5,564.

Removal of Pile Protection, Chicago, Ill.—U. S. Engineer, 537 South Dearborn street, awarded the contract for removal of pile protection in harbor here, to Great Lakes Dredge & Dock Company, 104 South Michigan avenue. \$8,555.

Levees, etc., Wisconsin.—State Legislature has appropriated \$50,000 to strengthen and rebuild levees and dams on Fox and Wisconsin Rivers, Fond du Lac and Winnebago Counties. J. D. Mack, State Capitol, Madison, engineer.

Steel Derrick Boat Hull, Mobile, Ala.—Sealed proposals were received by the U. S. Engineer Office, on August 6, 1923, for furnishing and delivering one steel derrick boat hull, length 80 feet, beam 34 feet, molded depth 5 feet.

Centrifugal Pump, Louisville, Ky.—The U. S. Engineer Office, Louisville, Ky., opened bids August 13 for one two-stage, 6-inch, vertical centrifugal pump, to be installed at the power house at Louisville and Portland Canal, Louisville, Ky.

Breakwater, Alpena, Mich.—U. S. Engineer, 337 Federal Building, Detroit, awarded the contract for furnishing and placing 11,700-ton core stone and 10,300-ton armor stone for rubble mound breakwater, Alpena, to T. L. Durocher Company, Detroit. \$76,340.

Construction of Superstructure, Ludington, Mich.—U. S. Engineer Office, Milwaukee, Wis., received sealed proposals on August 28 for removing stone-filled timber superstructure and constructing concrete superstructure on North Breakwater at Ludington, Mich.

Pump, Louisville, Ky.—U. S. Engineer, Post Office Box 72, awarded the contract for one vertical centrifugal pump to deliver 7,000 gallons per minute against head of 25 feet, complete with motor base, etc., to Morris Machine Works, Baldwinsville, N. Y. \$1,210.

Bids Rejected, New York, N. Y.—J. H. Delaney, Commissioner of Docks, Pier "A," North River, has rejected bids on Item 4, for dredging at street cleaning dumps in Boroughs of Manhattan and Brooklyn; also received no bids on Item 2. Will re-advertise.

Dredging, New Orleans, La.—The contract for dredging five miles in the Calcasieu-Sabine Section of the Intracoastal Waterway, 998,000 cubic yards excavation, has been awarded by the U. S. Engineer Office, 329 Custom House, to H. Reynolds, Maison Blanche Building, at a price of \$128,836.

Excavation, Delaware.—The contract for completing, widening and dredging Chesapeake and Delaware Canal, creating new entrance from Delaware Bay and improving entrance at Chesapeake Bay, Delaware and Maryland, 6,000,000 cubic yards excavation, to Atlantic, Gulf and Pacific Company, 13 Park Row, New York City, Sections A and D, \$740,688; Arundel Corporation, Pier 2, Pratt street, Baltimore, Md., Section B, \$257,359, by the United States Engineer Office, Wilmington, Del.

SHIPPING DEVELOPMENTS

United American Lines.—It is reported from abroad that the passenger steamship *Cleveland*, formerly the *King Alexander* and recently acquired by the Harriman interests for the United American Lines, will sail from Hamburg for New York with a full passenger list on October 23. The ship is being converted into a cabin class steamer at the Blohm & Voss shipyard.

River Transit Company.—Freight carrying on the Mississippi between Topeka, Kan., and St. Paul, Minn., has been resumed after a lapse of eight years. Four barges, owned by the River Transit Company, of St. Paul, are to be used exclusively for freight carrying.

United Steamship Company.—According to a report from the Department of Commerce, Washington, D. C., the United Steamship Company announces that it has decided to open a new regular line between Montreal and Copenhagen for the transportation of grain and piece-goods to Danish, Scandinavian and Baltic ports.

Strachan Steamship Company.—Announcement has been made by the traffic bureau and the foreign and coastwise committee through the Jacksonville Chamber of Commerce that the city of Jacksonville will have a direct steamship line to Pacific coast ports, and the first vessel will begin loading cargo at Puget Sound ports for this city this month. The Strachan Steamship Company with the Moore & McCormack Company, steamship agents and operators, have made the arrangements and will operate five vessels in the service between the northwest and this port.

Detroit and Cleveland Navigation Company.—The establishment of a passenger route between Detroit and Chicago early next summer, with stops at Mackinac Island, has been announced by A. A. Schantz, president and general manager of the

D. & C. Navigation Company. The new route has been made possible by the building of two new steamships by the D. & C. Company, said to be the largest operating on any inland waterways in the world. These boats will be in commission next summer and will be put in operation between Detroit and Buffalo and, according to Mr. Schantz, the two boats now in operation on the Cleveland line will be put on the new route to Chicago. The first of the two twin steamships has been launched and christened the *Greater Detroit*. The second ship will slide down the ways in about six weeks and will be named *Greater Buffalo*. Mr. Schantz said that these two new boats will allow the company to put the two large steamships, *Eastern States* and *Western States*, on the Chicago run. A schedule of 36 hours between Detroit and Chicago will be put in effect at once and a single stop will be made at Mackinac Island.

Holland-American Line.—The Holland-American Line has announced that its steamer *Rotterdam* will sail from New York on February 6 of next year on a Mediterranean luxury cruise. Passengers are already being booked and this trip promises to be unique and different in many ways from the usual tour cruise. The cruise will cover calls at Madeira, Spain, Algeria, Athens, Constantinople, Palestine, Egypt, Italy and the Riviera. Final arrangements are being completed by representatives of the company with hotels, railroads and others to receive the visitors. The cruise is limited to 500 guests, thus eliminating all crowding or confusion as the *Rotterdam* can accommodate 1,000 persons.

White Star and American Lines.—Announcement of a joint passenger and freight service to be operated between New York and Hamburg by the White Star Line and the American Line has been made at New York. The American Line has maintained a service for cabin and third class passengers and freight between New York and Hamburg since 1920. At present it is maintained by the *Manchuria*, *Mongolia*, *Minnekahda*, *Finland* and *Kroonland*, all American flag ships. Owing to the disadvantages under which they labored, three of these steamers, the *Finland*, *Kroonland* and *Manchuria*, are to be transferred to the Panama Pacific for operation between New York and California ports, beginning in October.

The White Star Line has been operating a service for cabin, third class and freight between New York and Bremen since the spring of 1923, with the *Pittsburgh* and the *Canopic*.

Under the new arrangement, the White Star Line will transfer its German business from Bremen to Hamburg, where it will share with the American Line its new terminal at the Ross Quay, one of the best in Europe. It will dispatch its ships on dates alternating with those of the American Line, thus making a combined American and English flag service.

The first White Star Line sailing from New York in the new joint service will be that of the *Canopic*, October 18. The *Pittsburgh* will follow on November 8. The American Line's first sailing under the new schedule will be the *Mongolia*, October 25, and the *Minnekahda*, November 1.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York

President—E. A. Simmons.
Secretary—K. W. Heinrich.

The New York Tow Boat Exchange

11 Moore St., New York.

Secretary—Irving G. Keller.

Port of New York Authority

11 Broadway, New York

Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.

Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vin St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.

Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1600 Walnut Street, Philadelphia, Pa.

Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York

President—A. G. Smith.
Vice-President and General Manager—Winthro L. Marvin.

United States Ship Operators' Association

149 Broadway, New York

President—C. H. Potter.

National Merchant Marine Association

Munsey Bldg., Washington, D. C.

President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City

President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.

Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City

Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City

Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morris
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Navali e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

November, 1923

Number 11

Published Monthly by

ALDRICH PUBLISHING COMPANY

In Conjunction With

SIMMONS-BOARDMAN PUBLISHING COMPANY

30 Church Street, New York

JAMES SWAN }
H. H. BROWN } Editors

L. S. BLODGETT, Associate Editor

W. Z. GARDNER, News Editor

Contributing Editors

Rear Admiral C. W. Dyson, U. S. N.

William T. Donnelly

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MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), and the Audit Bureau of Circulation (A. B. C.)

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The American Marine Congress

IF the approaching Marine Congress can, as the result of its deliberations, line up the many and varied interests directly concerned in, or contributing to American sea-borne trade, if it can formulate a United States shipping policy which will solve present problems and establish a firm foundation upon which the American flag may be permanently established on the seas, it will have accomplished its purpose and will have rendered the country a service of unparalleled value.

To a far greater extent than has prevailed at any previous convention, this congress will represent the general business interests of the country, and its work will embody the results of serious consideration on the part of bankers, manufacturers, railroad executives, representatives of agricultural organizations, exporters and importers; in short, of representatives of every form of commercial activity having interest in the country's ocean trade.

While the sum total of those directly engaged in maritime pursuits is relatively small and, by itself, limited in the accomplishment of political or national ends, the coming congress will represent a very large proportion of the business activities of the entire country. Under the guidance of its chairman, Secretary of Commerce Hoover, its deliberations will assume a broadly national aspect, and their result should be a shipping policy back of which the united business of the country can stand.

Approximately one hundred organizations have signified

their intention of participating, the delegates comprising men nationally known in almost every important industry. Co-ordinated by Mr. Hoover's unexcelled genius for organization and administration, the results of the deliberations of this unusual body of men may well prove epoch making in the history of the American merchant marine.

The Shipping Board's Policy

THE statement of the chairman of the Shipping Board, published elsewhere in this issue, gives an outline of the problem confronting that body. It is our experience that the chairman, personally, is a clear and concise thinker. That he has a comprehensive idea of the end to be sought from the Government's viewpoint is unquestionably true; but with six associates, with six different minds on many phases of the problem, there is little hope for an immediate solution. Further, since the board is essentially political and the policy of the Government seems to be that of persisting in holding the reins instead of disposing of the vessels and routes in a businesslike way, there is no prospect of early relief from the financial burden and hindrance to shipping involved in any continuance of the Shipping Board and its appendix vermiformis, the Emergency Fleet Corporation.

There is nothing in the program of the Shipping Board as given in Mr. Farley's communication that could not be carried out by private owners; and there is no necessity for continuing a great mass of expensive machinery for further experimental purposes. However, since the gods have decreed otherwise, what is the alternative?

Mr. Farley has made it clear that the Shipping Board will continue to operate ships indefinitely. But how about getting rid of useless vessels which, so long as they are riding at anchor, are derelicts in the shipbuilding industry?

A considerable number of ships have been disposed of; but a far larger number remain on the board's hands. Many of the latter are competitive or could be made so by changes in their machinery; but after deducting all ships of actual or potential commercial value there still remains a depressingly large fleet for which, even when looking into the future, no conceivable use is apparent. Some definite disposal of the mass of useless tonnage, and that at once, would appear to be the first and obvious step in the solution of the Shipping Board's problems. It is something which will have to be done eventually, and there is no good reason for further delay.

Turning to the competitive vessels, it is the intent of the

Jones Act and is understood to be the purpose of the board, as at present constituted, to dispose of them at the earliest possible moment to private parties.

The valuation of the board's fleet, recently published, works out to a considerably smaller unit price than that at which the ships have heretofore been held, but so far as we are aware no change in sales policy has been made. It seems to us that the time is opportune for pricing the vessels individually and at such a figure that their purchase by private interests would be within the limits of good business judgment.

Local Strength of Steel Ships

THE enormous energy stored up in a moving vessel, as well as the ability of a well-constructed steel ship to endure the severest punishment and successfully localize its effects, are well illustrated by the photographs of the damaged steamers *Hoven* and *West Arrow* which are reproduced elsewhere in this issue. In each vessel, notwithstanding the severity of the blow received, the damage was mainly confined to its immediate vicinity. In the case of the *Hoven* the longitudinal framing of the hull undoubtedly contributed to a considerable extent to this result. One cannot but wonder how much more extensive the damage might have been, had it not been for the heavy longitudinals which received the impact very nearly on end.

The results speak well for the character of material and workmanship entering into the construction of both vessels and should go far to set at rest the doubts entertained in some quarters as to the quality of the steel of which the Shipping Board vessels were constructed.

A Real Opportunity

THE present Government shipping situation, discouraging as it appears to the private owner and operator, has one hopeful side and presents a condition which, if opportunity is given in a proper and businesslike manner, may be developed in such a way as to be of the utmost advantage to the American merchant marine.

As described in detail elsewhere in this issue, a considerable portion of the Shipping Board's fleet is available for conversion to Diesel drive. These ships are of good design, so far as their hulls are concerned, and are at present in a fair state of preservation. We believe, if the board were to put in practice the methods of advanced modern salesmanship, that the potential value of the converted Diesel ships would be shown in a most convincing way.

The opportunity is at hand for the development of an American fleet of motorships at a cost materially less than is possible in any other country. It will be little short of a national calamity if, as the result of present depressed trade conditions and the consequent hesitancy of capital to embark in marine undertakings, this opportunity is allowed to pass unheeded.

By all means the Construction Loan Fund, now held by the Shipping Board for building purposes only, should be made available for the conversion of tonnage to Diesel drive and such legislation as is necessary to this end should be

enacted at the coming session of Congress. With the difficulties of capitalization thus relieved, there appears no serious obstacle standing in the way of placing competitive American motorships on the high seas and, at the same time, by the consequent increase in production of Diesel engines, enabling the builders of this class of machinery to approach more nearly to manufacturing conditions and the resulting reduction of cost.

The main and most frequently expressed objection to Diesel machinery is its present high cost and by enabling the builders to reduce this as the result of increased business is a matter second only in importance to the "Dieselizing" of these otherwise unproductive vessels.

It seems to us that along this line there is more of promise to American shipping than by any other channel now open.

The English Cinch

OVERTURES have recently been received from the British market by American hull underwriters, suggesting cooperation in preventing a further reduction in rates and values on hulls. The communication has been received from the Institute of London Underwriters and contains a recital of the understanding reached by London Underwriters as embodied in the following resolution:

"That in future no reductions in rates shall be given and no reduction in values without proportionate additional premium. This resolution to apply to steamers of any flag and also to renewals of foreign reinsurance placed in this market but not T. L. O. insurances."

The irony of this appeal can scarcely escape anyone familiar with the hull situation. It will be recalled that immediately following the cessation of hostilities in the world war the British underwriters notified the American market of the abrogation of their agreement to respect advisory ratings on American bottoms as promulgated by the American Hull Association. The object of this peremptory action was unmistakable. The American market, during the war, had obtained a large share of the American hull business, and the British underwriters wished to be free to recover as much of the business as possible, and did not want any impediment to this end so that they might obtain the business at whatever rate or on whatever conditions necessary.

The British market, because of its scope and financial backing, was in a position to capture the business regardless of the cost. We all remember the facility with which they accomplished their object. Rates were cut to a point where American underwriters, never very keen for hull business, were willing to have the business pass out of their hands, realizing that they could not hope to compete with the methods of the British market.

For five years British underwriters have paid through their nose for their grasping methods and have at last reached the point where they feel that a halt must be called. They now seek to consolidate and make profitable their gains and have the effrontery to call upon foreign underwriters for cooperation in retaining the business which they took in such a ruthless manner. It is to be hoped that American and other foreign underwriters will know how to treat such an appeal.

American Trade Needs American Ships

History Proves the Necessity for, and Common Sense Demands the Use of, American Ships for Developing Our Foreign Trade

By E. C. Plummer

Commissioner, United States Shipping Board

IN discussing our country's "great embargo" ordered by Congress on December 22, 1807, the *Americana* (Vol. 10, Page 273), states: "The agricultural classes who controlled the administration did not believe in commerce and preferred abolishing it to spending anything for its protection."

The broader views, which have come through a century's education, cause us to stand astounded before the proposition that there ever could have been a time when a majority of our people, either by affirmative declarations or by equally effective acquiescence, preferred to abolish our foreign commerce rather than to incur any expense for its preservation; yet an equally incomprehensive attitude toward American ships for our foreign trade dominates United States policies today!

AMERICAN CITIZENS LACK NATIONAL VISION

The need of foreign trade for the United States is recognized by all. The necessity for foreign markets where our surplus goods may find an outlet is understood by many, but the fact that American ships are absolutely essential to the proper development of such markets appears to be understood by but a few, if we may judge popular comprehension by results actually attained. Until there has been legislation which actually puts into the foreign trade of this country ships owned and operated by citizens of the United States the people of this country, whatever their private views may be, must stand charged with the same lack of national and commercial vision as brought about the legislation of 1807-1809, and ended in war.

WHAT OUR COMPETITORS KNOW

Our competitors clearly perceive the mistake this country is making. Says *Fairplay*, England's marine journal, quoting Britain's commercial authority (September 20, 1923):

"One cannot but be struck with the comparatively small amount of United States foreign exports in comparison with the colossal production of that country. * * * The question which the United States will presently have to answer is to what extent her manufacturers can rely on home consumption for a market for their goods. * * * How long this somewhat artificial prosperity will last is quite another question. If there is no market for dumpable surpluses, they will not represent wealth; and in such case the effort will be as wasted as our own in 1920, when we produced more than we could sell here and abroad, with staggering consequences."

The vast unemployment, on account of which England has spent millions upon millions, is one of the "staggering consequences" referred to here—and the end is not yet!

The exhaustion of all our surplus supplies brought about by the world war and the great deficiency in building operations which we are now engaged in supplying have created a home market which has placed American labor in a very advantageous position; and it is the part of wisdom for us to take such action now as will enable us to keep that labor fully employed when our exceptional industrial activities shall have become normal, as they necessarily will become within the next five years.

OPERATION OF AMERICAN SHIPS PAYS \$100,000 PER DAY TO AMERICAN LABOR

Here the importance of a foreign trade merchant marine as a United States industry in itself should be considered. The wages paid on Shipping Board vessels in that trade alone is eighteen million dollars a year. The voyage repairs on those ships alone amount to twelve million dollars per year. These two items alone, to say nothing of supplies and equipment replacements, mean one hundred thousand dollars per day in wages paid to American labor. And ships in their

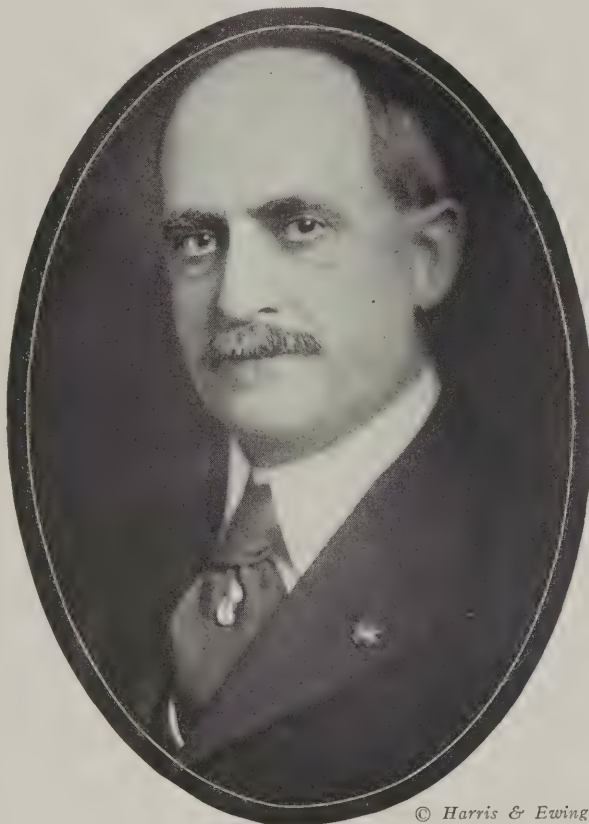
construction and upkeep call upon practically every industry for a contribution—everything that goes into the building of a home or a hotel is to be found in a modern steamship. This is only the constant, day-by-day employment resulting from ship operation. It does not include the vast employment created by ship building.

Now we come to the persistently iterated fallacy that there are always foreign ships enough to handle properly all the foreign trade of the United States.

FOREIGN SHIPS WILL NOT PROVIDE PROPER TRANSPORTATION FOR OUR GOODS

That, as a rule, there are ships enough under foreign flags to furnish transportation for American goods may be admitted; but that they have furnished, or will furnish, proper transportation facilities for our goods is not true. Take this admission made in *Fairplay* on August 30, last, discussing the movement of only one of America's great staples, cotton. It says:

"The Americans often found that there were no boats available
(Continued on page 652)"



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E. C. Plummer

American Ships Are Carrying Less Than 25 Percent of the Overseas Commerce of the United States

Figures Supplied by the Research Department of the Shipping Board Show That the Majority of Our Exports and Imports Is Handled by Foreign Shipping

THE merchant marine of the United States may properly be divided into four distinct classes according to the services in which employed.

(1) The ocean going vessels of one thousand gross tons and over employed in the foreign trade of the United States.

(2) Vessels of 500 gross tons and over employed in the coastwise and intercoastal trade, in offshore traffic.

(3) Vessels employed on the Great Lakes exclusively.

(4) Vessels employed on inland rivers, land locked lakes, inland bays, and inshore traffic.

Of the four classes the first is the one to which we look to establish and maintain our position as a maritime nation in times of peace and to provide us with adequate transportation in time of national peril. The foreign going ship is the one that must meet the competition of other nations for the carrying trade of the world and, in a survey of the activities

American Trade Needs American Ships

(Continued from page 651)

for them in the summer months. The Shipping Board has supplied that deficiency. * * * the want of regular sailings had been in existence for many years, but the European carriers had made little effort to supply it."

There's an admission by the spokesman of our chief competitor in world trade! This attitude has been typical; and it is one of the principal reasons why there has existed that "comparatively small amount of United States exports," cited by the British commercial authority above referred to.

FOREIGN DISCRIMINATION AGAINST AMERICAN TRADE

But there has been something more than mere neglect. A few years ago Senator Fletcher, of Florida, exposed in the United States Senate the discriminations which, by increasing the freight charges on American cement sold to South American purchasers, made it impossible for that United States product to compete with the far more cheaply transported British product; and that case where the sale of fifty American-built locomotives to Argentine purchasers was defeated by an increase of three dollars per ton in the ocean freight rate on them will readily be recalled.

The recent exposure by our Postmaster General of the systematic detention of mails to the United States that they might go on British ships, ignoring available American tonnage, speaks for itself.

I am offering no criticism of such practices as those referred to here—on the contrary, I admire the wisdom of Britons who realize the necessity of their giving every possible bit of business to their ships and to their manufacturers. I cite these facts merely as showing how foolish is the claim that foreign ships can or will serve the people of the United States as well as ships belonging to and operated by our own people. Now for a concrete case showing how American ships build up the foreign trade of this country.

HOW AMERICAN SHIPS BUILD UP OUR FOREIGN TRADE

When the United States had recovered its commercial equilibrium following the civil war era, the United States and Brazil Steamship Company was established. As soon as it had shown material results in building up American business with the east coast of that continent sharp competition was established by Europeans, and in 1890 the line was driven out of business. Then, as now, the extra cost of operating ships under the American flag was a fatal burden which Congress had imposed but refused to share. The net result was that Europeans became predominant in foreign trade

then so that at the beginning of the world war Great Britain had engaged in trade with the east coast of South America alone more tonnage than she had with the east coast of the United States, Canada and all the West Indies combined (Page 141, Report to Parliament, 1918).

Following the world war United States vessels established a regular and high-class service to the principal ports of Brazil and Argentina, with a result which may well be stated in the words of Sir John E. Thornycroft, whose recent report—appearing in *Lloyd's*—says:

"The Americans are pushing everywhere and taking control. Large orders for locomotives, for coal plants, grabs, etc., have recently gone to the United States, and a new steel factory is equipped with American machinery, while it is probable that large orders for electrifying the State Railways will also go to America."

COMMERCE WITH THE FAR EAST INCREASED BY AMERICAN SHIPS

Take Oriental ports to which the Shipping Board now operates two first-class lines of steamers, the Admiral and the Pacific Mail. In 1914 our total commerce with the East amounted to but 2,418,654 tons, of which less than 10 percent was carried by American vessels. That trade has increased to 5,255,000 long tons, of which 55 percent is carried in American vessels.

Unquestionably American ships are essential to the proper development of our foreign trade; unquestionably the heavy losses which Shipping Board vessels have suffered during this continuing period of depression in ocean freight rates have been much more than made up to our people in savings on transportation charges paid by our exports and imports (grain having been carried this year at as low as six cents per hundred weight), as well as in the development of foreign markets for our products; and since the cost of operating American ships is from seven to ten percent higher than the costs of their competitors, as a result of American standards, unquestionably the Government should put our ships on an equality with their competitors, just as it does in the case of other great industries, so that the Shipping Board ships may be sold and private enterprise given an opportunity to develop the foreign trade of this country, which trade within five years will prove to be one of the very essential pillars of this country's prosperity.

CORRECTION.—On page 618 of our October issue the captions of Figs. 7 and 8 in the paper on Scotch boiler tests were inadvertently interchanged; i.e., the higher efficiency curve applies to the forced draft test and the lower efficiencies to the induced draft.

of American merchant vessels and their employment, is the only class in which comparisons can be made that would indicate the growth or recession of our position as a factor in transporting the manufactures and products of our own country, the raw materials necessary to our industries, as well as the manufactures of other nations.

GROWTH OF MERCHANT FLEET

The past decade has witnessed the growth of our steam merchant fleet (exclusive of Lake vessels) from 725,000 gross tons on June 30, 1914, to 11,600,000 gross tons on July 1, 1923. Practically the whole of this increase is due to the construction program of the United States Shipping Board. The total gross tonnage of our vessels is not a conclusive measure of their usefulness, however, as many of the vessels registered for foreign overseas trade are laid up and in the instance of the wood vessels condemned for salvage although still remaining in the documented lists. The measure of our activities in foreign trade lies in the consideration of those

employed in the trade with the nearby foreign regions 39 passenger vessels of 168,417 gross tons, 78 cargo vessels of 220,118 gross tons and 72 tankers of 369,893 gross tons—a total of 189 vessels of 758,428 gross tons. These vessels carried in June of this year 557,000 long tons of dry cargoes or 46 percent of the total regional commerce with the United States and 952,000 tons of oil or 77 percent of the total imported. The combined traffic with the nearby regions amounted to 2,446,000 long tons of which American vessels carried 1,509,000 tons or 61.7 percent.

VESSELS IN OVERSEAS SERVICE

In the long haul traffic of overseas trade the employment of American vessels and the proportionate cargo carried is best illustrated by subdividing the trade into continental regions and the following tables illustrate the tonnage engaged at the close of the fiscal year and its distribution and the amount of the regional proportion of commerce carried by American vessels.

Overseas Employment of American Steam Vessels of 1,000 Gross Tons and Over On June 30, 1923

American Flag	Passenger		Cargo		Tanker		Cargo Carried June, 1923, Long Tons	Percentage of Total Cargoes	Regional Total Vessels Employed	
	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons			No.	Gross Tons
South America—										
East Coast	7	85,973	30	163,088	4	25,834	106,053	30	41	274,895
West Coast	4	19,578	20	99,285	1	7,110	97,924	44.3	25	125,973
	11	105,551	50	262,373	5	32,944	203,977	35.6	66	400,868
Europe—										
Atlantic	20	298,271	153	861,906	12	76,870	455,076	25.8	185	1,237,047
Baltic	..	..	13	64,841	3	19,434	25,329	9.9	16	84,275
Mediterranean	1	5,083	40	208,133	1	5,106	72,000	14.8	42	218,322
	21	303,354	206	1,134,880	16	101,410	552,405	22	243	1,539,644
Africa—										
West Coast	..	..	7	37,214	..	..	8,153	41.9	7	37,214
East Coast	..	..	7	41,783	..	..	10,796	25.6	7	41,783
	..	..	14	78,997	..	..	18,949	36.7	14	78,997
Asia—										
Orient	12	154,735	64	399,066	11	78,588	148,423	41.5	87	632,389
Far East	..	..	13	79,023	4	30,304	35,343	23.6	17	109,327
	12	154,735	77	478,089	15	108,992	183,766	36	104	741,716
Australia	2	12,561	13	77,053	..	..	14,886	18	15	89,614
Around world	..	..	6	38,781	..	..	..	..	6	38,781
Total overseas	46	576,201	366	2,070,173	36	243,246	973,983	24.7	448	2,889,620

Nearby Countries and Domestic Trade

Mexico—West Indies and Caribbean.....	39	168,417	78	220,118	72	369,893	.....	..	189	758,428
Coastwise—										
Atlantic	44	170,390	153	497,440	69	369,670	.....	..	266	1,037,500
Pacific	29	80,655	77	149,567	25	138,356	.....	..	131	368,578
Intercoastal	7	36,385	154	885,685	113	875,166	.....	..	274	1,797,236
Porto Rico	6	22,453	15	45,142	..	..	.....	..	21	67,595
Hawaiian	11	68,606	7	31,435	5	28,680	.....	..	23	128,721
Total nearby and domestic.....	136	546,906	484	1,829,387	284	1,781,765	.....	..	904	4,158,058

Summary

Total active vessels.....	182	1,123,107	850	3,899,560	320	2,025,011	.....	..	1,352	7,047,678
Laid up and inactive.....	23	192,534	975	4,017,724	60	289,214	.....	..	1,058	4,499,472
Total fleet	205	1,315,641	1,825	7,917,284	380	2,314,225	.....	..	2,410	11,547,150

vessels of 1,000 gross tons and upward in continuous service on regularly established routes, that are the carrying factors of our ocean transportation system.

DIVISION OF FOREIGN TRADE

The foreign trade of the United States falls naturally into two divisions—first, trade with foreign ports of North America, Central America, Mexico, West Indies, and other foreign islands of North America to which voyages are relatively short and the tonnage requirements in relation to the volume of cargo carried are considerably less since the turnaround is more frequent, and, second, the overseas voyages to Europe, Africa, Asia, Australia, the islands of the Pacific and South America where the annual turnaround is greatly reduced and the tonnage requirements in proportion to the cargoes carried are much greater.

At the end of the fiscal year, June 30, 1923, there were

The vessels of the United States Shipping Board predominate in the overseas trade, the ratio being about 5 tons of Government owned vessels to 1 ton privately owned, this ratio of course varies in the different regions. Where the maintenance of services would be unprofitable for private capital, and markets and transportation by American vessels must be established and maintained, the Shipping Board vessels have been kept in continuous service despite the fact that they have operated without profit, as for instance in the transatlantic European services, where the keenest competition is met from maritime nations whose operating costs enable them to carry cargoes at the lowest ebb of freight rates, either at a small margin of profit or with an even break, the privately owned tonnage of the United States is represented by 52,879 gross tons while the Shipping Board maintains in this service a total tonnage of 1,075,687 gross tons of cargo vessels.

American Passenger Ships

TO an American, the crossing of the Atlantic for the first time on a vessel flying his country's flag is an event fraught with significance and one calculated to stimulate a train of thought not otherwise awakened.

Particularly is this true with one whose whole business life has been spent in close touch with the shipbuilding industry and to whom the Stars and Stripes at the peak of a fine transatlantic liner represents the fulfilment, at least in part, of a life-long hope.

NORTH ATLANTIC THE PREMIER STEAMSHIP ROUTE OF THE WORLD

Of all great ocean routes, that between Europe and North America is the most important; and it is here that commercial naval architecture and marine engineering have attained their highest development—in size of ships, speed, luxurious accommodation and safety. The blue ribbon of the North Atlantic is the blue ribbon of the maritime world.

In the sailing-ship era, American vessels, both as regards size and speed, held the Atlantic records for many years; but it is no part of the writer's intention to present a history of the decline of our merchant marine in overseas trade. The fact that the low point has been passed and that America is now in a fair way to regain at least in part her former enviable position on the North Atlantic makes more cheerful reading and the story of what has already been accomplished, however imperfectly it may be told, is of vital interest to all Americans who have at heart the welfare of their merchant marine.

UNITED STATES LINES A NATIONAL INSTITUTION

As is well known, the Shipping Board, through the United States Lines, has for the past two years been operating vessels in the North Atlantic passenger trade. It would appear, however, that the character and the extent of the service rendered by these lines of steamers are not as

well nor as generally recognized as they deserve to be, although the popularity of the service has increased by leaps and bounds during the past summer. The reports of passengers who have made passages by these vessels, and the writer has talked or been in communication with many of them, are practically unanimous as to the high quality of the service rendered and, in the minds of a steadily growing number of Americans, the line is established as a national institution.

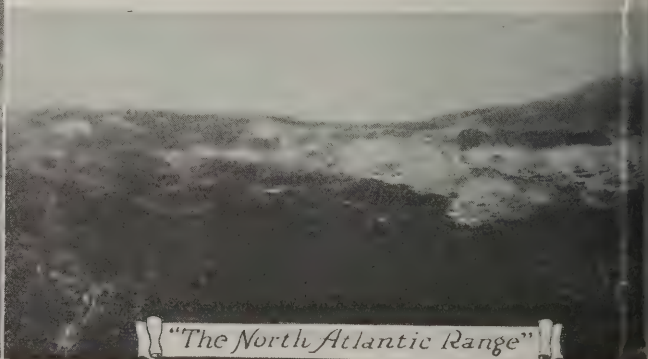
As at present conducted, the United States Lines are operating the following vessels:



*S.S. George Washington
Arriving in Port*



"Hitting it Hard"



"The North Atlantic Range"

Setting a High Standard

James Swan

Leviathan, New York-Cherbourg-Southampton; *George Washington*, *America*, *President Roosevelt*, *President Harding*, *President Arthur* and *President Fillmore*, New York-Plymouth-Cherbourg-Bremen-Southampton; and four smaller vessels, *President Polk*, *President Monroe*, *President Adams* and *President Van Buren*, between New York, Plymouth and London, two of them calling also at Queens-town.

The *Leviathan* is too well known and has been too often described to need any further comment at the present time. She is one of the world's finest ships, and after a period of special management, has just been taken over by the United States Lines, and will undoubtedly be run by them in the efficient manner which has built up the popularity of their other vessels.

THE GEORGE WASHINGTON POPULAR WITH TRAVELERS

In the *George Washington*, the line possesses, thanks largely to its own efforts, what is perhaps the most popular vessel with American travelers in the Atlantic service today. This fine ship is an intermediate type steamer of 23,788 gross tons, approximately 20,000 horsepower and over 17 knots' speed in average weather. For solid comfort it is hard to imagine anything more nearly perfect than this ship. The decks and cabins are spacious, the public rooms well arranged, comfortably furnished and well finished and decorated, but without the excessive decorative and lavish and really unnecessary detail which to many appears out of place on shipboard. Furthermore, the vibration and discomfort often experienced in heavy weather on very high powered ships are practically absent.

The writer has recently had the good fortune to make a round trip on the *George Washington*, the trip east unusually smooth and the return in heavy weather. The behavior of the ship in the heavy head sea was perfect and clearly showed the superior comfort of the intermediate type ship under rather trying conditions. So far as management and the internal running of the ship were concerned, there was nothing but praise from everyone—for the veteran captain and for all of his efficient and smooth running organization; and it is pleasing to know that this state of mind is also reflected by those who have traveled on the other vessels of the line, several fellow passengers telling the writer that they had experienced equally pleasant and satisfactory service on the *America*, the *President Roosevelt* and on the London ships.

The *America* is also an intermediate ship, somewhat smaller than the *George Washington*, but in general of similar design and type.



Capt Cunningham on the Bridge with Gen. Pershing



How a 75 Mile Gale Looks



"A Heavy Head Sea"



Looking Out of an Air Port

The *President Roosevelt* and *President Harding* are of the "535-foot" type, the construction of which was commenced during the war, as transports, but altered later to combination passenger and cargo vessels. While not as large as the *George Washington* and *America*, they are somewhat more speedy, have fine accommodations and are good sea boats.

The *President Arthur* and *President Fillmore* are old German vessels, and here again the placing of them in service was due to the lack of other more suitable vessels.

The four *Presidents* running to London are in reality cargo vessels, having limited passenger accommodations. While the quarters on these ships are excellent and the service rendered appears to have called forth nothing but praise, they are not suited to the trade and were only placed on this run as a measure of expediency. They have now been sold and it is understood are to be replaced by ships of the Hog Island transport type carrying cargo only. So far as passenger service is concerned the demand warrants the placing on this line of large intermediate type ships, were any such available.

UNITED STATES LINE LACKS HOMOGENEITY

From this brief description, it at once becomes apparent that the fleet of the United States Lines is almost entirely lacking in the important element of homogeneity and the difficulty of maintaining an evenly balanced service thus greatly magnified. The salient feature is that, notwithstanding the lack of proper tools to work with, the management has succeeded in building up a business good-will of the greatest value and one which should be maintained at all costs, if America is to retain a place of any importance in the Atlantic passenger trade.

By far the larger part of the income of all vessels engaged in this service comes out of the pockets of American citizens. There is now offered an opportunity for the latter to obtain excellent service on their own vessels; and that this opportunity is being taken advantage of is shown by the heavy passenger lists of the American ships as compared with those of foreign lines.

What then are the probabilities of holding and building up this business in the immediate future? The *Leviathan* by herself cannot maintain first class high speed service. At least two other fast vessels are needed by next summer if a well-balanced express service is to be established, and more large ships are needed if German competition is to be successfully met next year. The line to London does not appear of quite the same importance as the others; but there seems little doubt of its success if proper vessels can be provided.

NEW AMERICAN LINERS NEEDED

Undoubtedly, the ultimate end to be sought is the construction of new American vessels for all of these services. With operating conditions as at present, it seems out of the question for private companies to undertake the construction of Atlantic liners and, even if Congress should decide to pursue this course, it would be a matter of at least two years before the new vessels could be placed in commission. It remains then to make use of such ships as are at present available if the business is to be held in the immediate future. The *Republic*, now being reconditioned at Newport News, is a fine ship but lacking in the important element of speed.

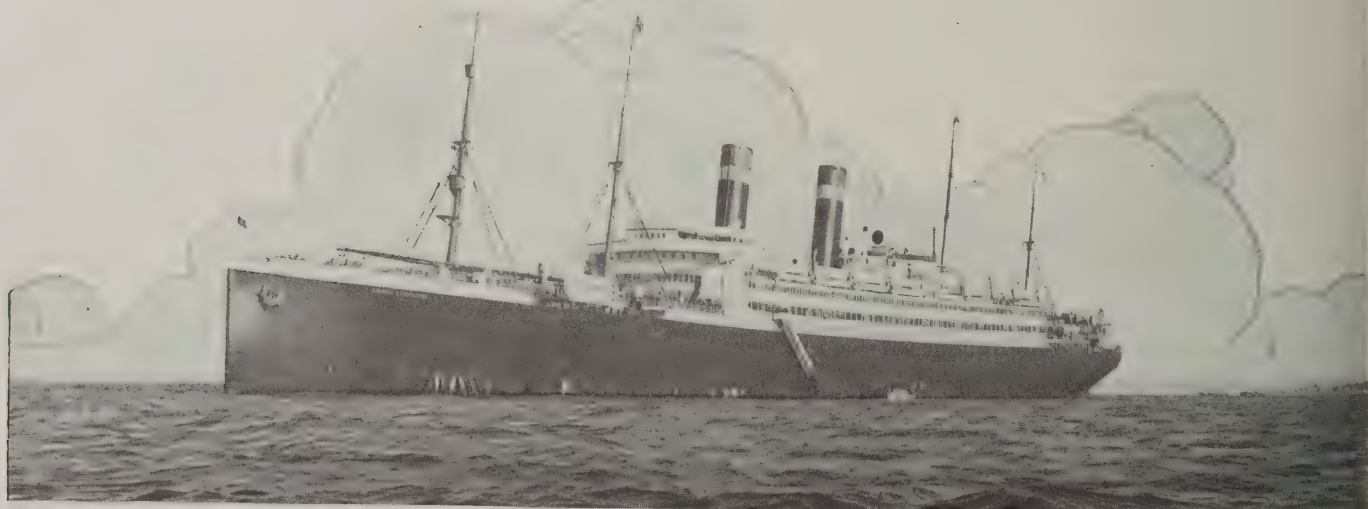
AGAMEMNON AND MOUNT VERNON SHOULD BE RECONDITIONED

It seems of utmost importance immediately to build up the high speed service. Apparently the only way to accomplish this in time for next year's business is to recondition the *Mount Vernon* and *Agamemnon*. These two fine vessels have unexcelled records in the Atlantic passenger service, and their potential value cannot be neglected. Their hulls and propelling machinery are in fair condition, and it is believed that passenger accommodations, similar in character to those on the *George Washington*, could be constructed at a relatively moderate cost.

Of course the advisability of reconditioning depends upon its cost. If it were absolutely necessary to carry out the rather radical changes which have been proposed and which would involve an expenditure of approximately \$8,000,000 on each vessel, the universal opinion is that the ships are too old to warrant any such outlay. On the other hand, if they can be put in commission at a cost of not over \$3,500,000 each, and it is believed that this is quite possible, the growing business and national importance of the line would appear to amply justify this course.

Whatever decision is finally arrived at regarding the use of these vessels, they should not be disposed of to foreigners. If they are sold to foreign account, their appearance by next year as our competitors for Atlantic passenger trade is practically certain.

America has already established a service second to none in efficiency and popularity, limited only by the number and type of the ships in operation. The means are at hand for increasing and perfecting this service, and we believe it to be the will of a steadily growing body of her citizens that this should be done and that America should retain her place in the transatlantic passenger trade.



Steamship *George Washington* of the United States Line

The Navy and Merchant Marine Are Interdependent

Both Must Be Maintained for the Safety and Prosperity of the Country—Large, Fast Passenger Vessels Our Greatest Need

By Edwin Denby

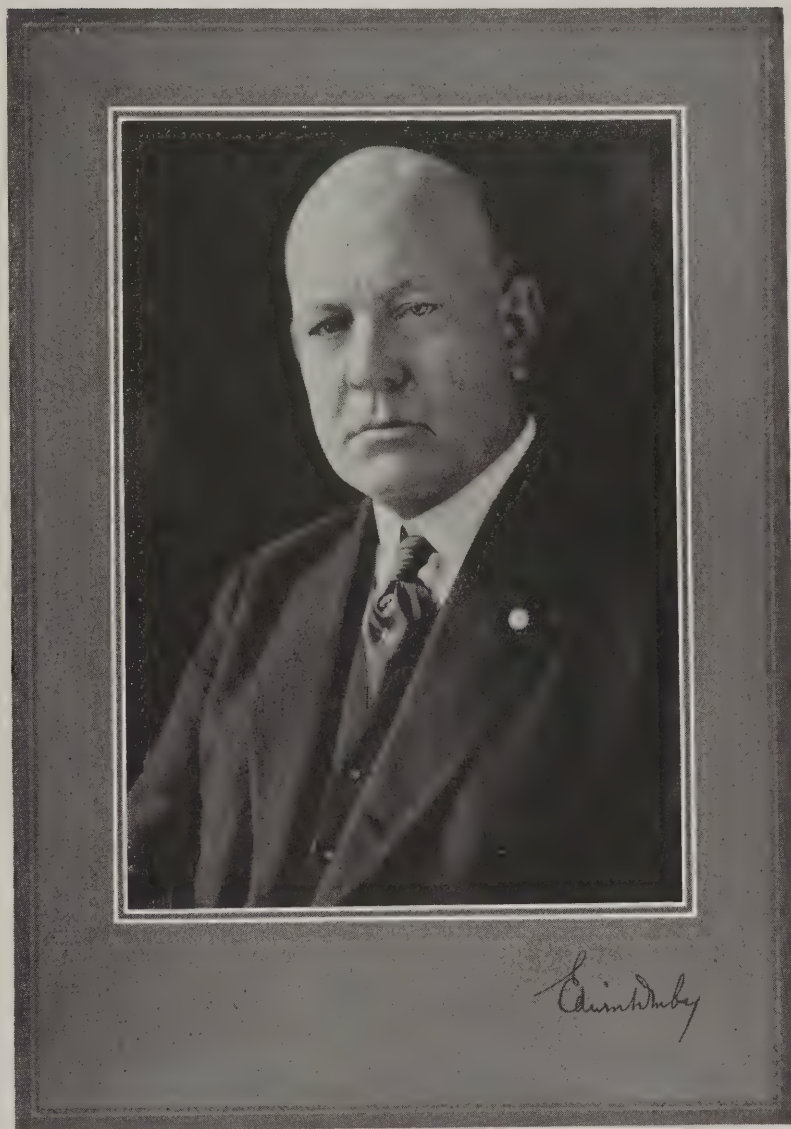
Secretary of the United States Navy

IF we are to maintain the American standard of living as it exists in our country today, we must have foreign trade. If we are not to pay toll to foreign shipping and have our foreign trade at the mercy of competitors, we must have a fair share of our foreign trade carried by our own merchant marine. If we are to be a great power, truly independent and free from commercial subserviency, we need a great merchant marine to carry on our commerce.

All great maritime nations have made provisions, in some way, for taking merchant shipping into the naval service in time of war. This has taken the form of subsidies or subventions, direct or indirect, discriminating rates to further the growth of the merchant marine, etc. At least the merchant ships can be listed and classified and plans made for their transfer to the Navy.

When war comes and the entire military strength of the nation is to be exerted, the Navy must draw vessels from the merchant marine for navy use—cruisers, transports, fuel ships, repair ships, distilling ships, hospital ships, mine layers, mine sweepers, patrol ships, destroyer tenders, submarine tenders, aircraft tenders, tugs and supply ships of all kinds. In addition, the merchant marine must continue the transportation of articles of commerce essential to the welfare of the people as a whole. When we organize for war, the Navy and the merchant marine become practically one service administratively. During the world war, 95 percent of our merchant shipping was under Government control, particularly as to cargoes and routes.

In 1898 we armed the few large passenger liners we had for distant scouting and general cruiser service. They did what they could, but due to the lack of numbers Cervera's fleet cruised at liberty in the West Indies, and was discovered only after it had been in Santiago for some time. This with a war at our very doorstep and against a power that was even



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worse off than we were.

In the employment of converted merchant ships as cruisers, many conditions may arise. Our Navy may be employed in protecting trade routes used by our merchant marine; it may be engaged in raiding the sea lanes used by the enemy or denying him the use of them. Its operations may or may not lead to fleet actions. Our merchant marine may be carrying on foreign trade or it may be shut up in port. In any case, the Navy will be short of regular cruisers and the converted merchantmen must fill the deficiency. As the regular Navy is reduced the importance of the converted merchantmen increases. A large merchantman, converted to a fighting ship, may carry a battery formidable for a cruiser and have a great fuel endurance, and, if there are no regular cruisers available for operations in a particular theatre, the converted merchantman becomes of prime importance there. Our greatest need would be for large fast

passenger vessels for use as transports, scouts, armed cruisers and seaplane carriers. In this class the United States is very deficient, having only four such vessels of over 20 knots.

As an addition to naval strength, the personnel of the merchant marine—a body of men with the sea habit—is a naval asset, whether in war it be employed on regular naval vessels, on merchant vessels converted to naval use, or on merchant shipping for naval or merchant service. When we entered the world war, our battle fleet had to devote itself to the training of raw recruits in the most elementary duties of the seamen, because we had no merchant reserve to call upon.

The Navy can never be considered adequate to fulfill its mission until it has the backing of a good merchant marine, but a good merchant marine is a poor investment without the protection of a good Navy. In peace and in war the two are interdependent. In my opinion the safety and prosperity of the country demand that we maintain both.

A Merchant Marine Is Necessary for National Defense*

The Navy, Our First Line of Defense, Especially Needs the Support of a Strong Fleet of Merchant Ships

By Rear Admiral Charles P. Plunkett, U. S. N.**

EARLY in the history of our country the question came up of providing for a purely American merchant marine. That question has been agitated every year since then. It has taken every conceivable form that you could think of and the whole reason for all these variations, knowing what they want to accomplish, is the fact that we have been up against opposition, the opposition of the older nations of the world, and that opposition today is just as strong as it ever was.

I remember very clearly being present on the floor of the House of Representatives as a spectator when President Wilson read his war message to Congress and I couldn't help but think as the words fell from his lips that all this trouble came from one thing and that was the fact that we were not sufficiently strong on the sea to prevent any nation questioning our rights there.

We don't want to control the seas of the world. All we want is equality—equality in quantity, equality in justice, equality in opportunity.

I was present last year, when our late, lamented President read his message to Congress on the merchant marine. It is amazing that Congress could have adjourned without giving affirmative action after hearing what that great man said and the facts which he produced which were absolutely indisputable. But they did. The House passed the bill but it fell by the wayside at the other end of the Capitol and we are today in the same position that we have been in for over one hundred and thirty years.

Don't think for one minute that because you built a few ships during the war and you have a Shipping Board, a government organization for ascertaining information and for operation of those ships, you have a merchant marine. I don't know why I should make that comment, because every one of you knows that the thing that carried through this war was the people and not the material.

Now, there is our situation. We can go on building ships until the end of time, but if we don't create the people to operate them and run them and create all of the facilities connected with the operation of them, to the far ends of the earth, we will never accomplish what we are after.

POSITION OF AMERICAN SHIPS IN FOREIGN TRADE

Today our exports in American bottoms are about 38 per-

* From a speech made at the national convention of the New York State Department of the American Legion, Saratoga Springs, New York, September 13, 1923.

** Commandant of the Third Naval District, New York Navy Yard, Brooklyn, N. Y.

cent of what is shipped out of the country. Our imports are about 32 percent in American bottoms. The Congress has declared that it is the policy of the American people that it shall be at least 50 percent. What is the good of declaring a policy if it is not carried out? Our trouble is that we are forever declaring policies but only going into them halfheartedly. We have all these various policies and here and there are men working with their coats off to carry them out but we don't get the support for it that we ought to have.

We have leaders. We have intelligence. We have money—everything that is needed to put this merchant marine on the high seas and operate it, so that the farmers who are crying now about the price of wheat will not be bothered about their market. They are only one of the many who need this merchant marine. There is absolutely no reason in the world why we should not have it.

THE MERCHANT MARINE AND NATIONAL DEFENSE

Now, we talk about national defense. Why, the strongest argument that President Harding brought out for the merchant marine was the fact that it was an essential part of any scheme for national defense, that we could not be fully prepared unless we had a merchant marine. I can assure you that it is a pipe dream to take the naval fleets of America

seven thousand miles across the Pacific without an American merchant marine.

In order to do anything in this country of ours it has to take the form of a movement. It must be labeled and spread on the headlines of the press. That isn't 100 percent Americanism. The people are just not thinking 100 percent American. Your country expects that when you have spare moments, you will think about America and what is going to make America first, not something else, but first. And we can't be first unless we have a merchant marine.

FORMER POSITION OF GERMANY ON THE SEAS

Now, if you will take the time to read Admiral Mahan's splendid book on the "Influence of Sea Power on History"—every word of which is founded on fact—you will see why it is that things are as they are all over the world and how impossible it is to say to all the different tribes that existed in the past and exist today that each and every one of them shall be a separate and independent nation determined by themselves. Germany had no navy to speak of until the Kaiser read that book of Admiral Mahan's. Say what you please about the man, he realized that Germany could never

Shipping Board to Readjust Methods of Handling Its Fleet; Existing Routes to Be Consolidated

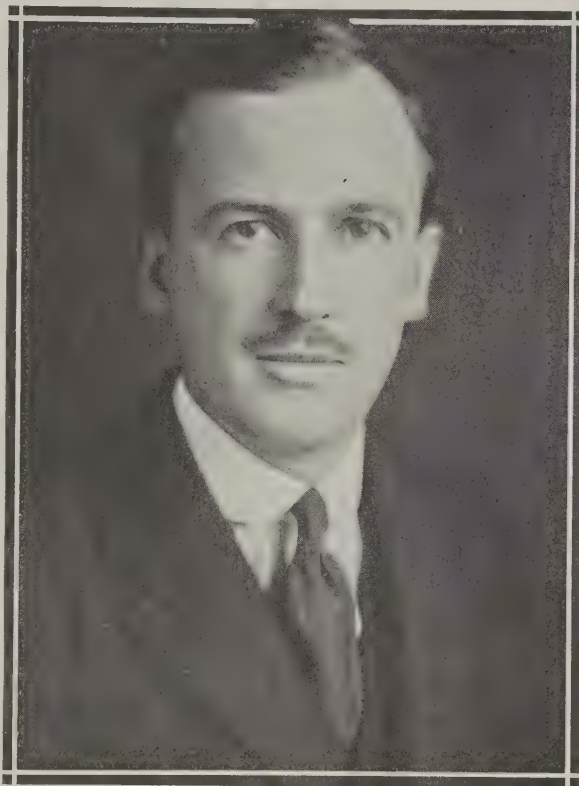
Essential Lines Will Be Gradually Extended and Transferred to Private Owners as Soon as Purchasers Can Be Found—Regular Sailings at Fair Rates To Be Maintained

By Edward P. Farley
Chairman, United States Shipping Board

THE Shipping Board's immediate problem is the operation of essential trade routes with the least possible drain on the national treasury. These trade routes should be gradually built up by efficient service and by extending our freight connections and creating a good will which will result in shippers sending their goods over our lines.

With the depressing effect of European conditions on world shipping, it must be expected that there will be but small profit in the operation of the most economical tonnage. Our own tonnage, necessarily more expensive, must be expected to show a loss in operation. During the period in which these losses are to be anticipated, the greatest possibility of economies lie in the consolidation of routes so as to carry the cargo offered with the fewest possible ships. This is the immediate aim of the Shipping Board in the consolidations being worked out, and in making them the board is creating that flexibility of movement which is essential to successful operation of shipping.

With the consolidation of routes, we will eliminate the ships now operating in excess of the number needed to carry the tonnage offered, while maintaining reasonable regularity of sailings. We will then have arrived at what may be considered bed rock conditions from which a gradual enlargement of the fleet can be anticipated as confidence grows in the services established and as international trade conditions improve. It is the intention of the Shipping Board, so long as it is operating any of the essential



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Edward P. Farley

trade routes, to put on whatever additional tonnage the business conditions warrant and to maintain on the routes fair and reasonable rates.

In connection with rates it should be borne in mind that it is of no permanent advantage to shippers, to develop or permit a condition to exist where their goods are carried at less than cost, including a fair return on invested capital. If any business is being conducted at a loss, it is but a question of time before a readjustment must be made in which, through the elimination of competition, new and higher prices are set up to the disadvantage of those dependent on that business.

We can perhaps say, therefore, that our immediate problem is the readjustment of the methods of handling the fleet, so that the business obtainable on essential trade routes can be carried with the smallest possible loss. Then we must turn to the gradual building up and extension of these lines through the service afforded, and provide for their transfer to private hands as soon as purchasers can be found. These purchasers will appear when, through im-

proved operations or changed shipping conditions, there is a possibility of profit in operation, and not before this time.

There is a differential against the American ship operator as compared with operators under foreign flags. There may be a difference of opinion as to the amount of this but it is a matter of national importance and we can confidently rely on Congress to enact specific legislation when its character and extent are clearly made known.

take her position among the nations of the world until she had a navy and a merchant marine.

With all due respect to everything else that has been said on this subject, we can thank God that the war came in 1914 and not in 1921 when the German fleet would have been completed.

Here we are today, the inventors of aviation, the inventors of the submarine, and where are we? We are way down at the bottom. We start things but we don't get anywhere. The only thing in my recollection that we have put over in first

class style was the world war and we had to do that or we would have been wiped off the face of the earth. That is the only thing that put our strength behind that war, the fact that we knew what we were up against and were determined to fight it out.

We have always talked defense. But you can't be strong defensively, you can't keep up the morale, unless you instill into the people who are carrying on, the idea that some day they may have to fight. It is ridiculous to try and support anything of the kind on any other basis.

Plan Proposed by the United States Ship Operators' Association for Operation of Government Tonnage

AT the joint hearing held in Washington by the United States Shipping Board on August 28, 1923, a plan for the operation of Government vessels was submitted by the United States Ship Operators' Association.

The following abstract gives an idea of the general intent and scope of this proposal:

The purpose of the plan is to put on the operator or agent a greater measure of responsibility than at present, so that, if the present losses increase, the agent will bear a substantial share of such increase; whereas, if they diminish, he will receive some of the resulting benefit. With these ends in view, the plan provides for the fixing in each service of a standard voyage figure based on operations for a number of months to be agreed upon. If the agent does not do better than the standard figure, he will get no compensation for operating and will receive only a husbanding fee. If the agent falls below the standard voyage figure, he will be obliged to bear an agreed upon percentage of such deficit. If his operation shows a surplus above the standard figure, he will receive a percentage of such surplus and the remainder will go to the Shipping Board, but of this remainder a certain part is to be put into a purchase and building fund

CONSOLIDATION OF ROUTES

The association agrees in principle to a consolidation of trade routes for the purpose of limiting competition between vessels of common ownership, but suggests further discussion along this line.

Each agent, when undertaking operation, must have tangible net assets of an amount to be later determined for each vessel that he undertakes to operate.

Vessels shall be allocated by the Shipping Board to agents to be operated by them as the board's agents on different trade routes, the agents guaranteeing maintenance of these routes for a definite period.

Vessels shall be delivered to the agent in good condition, fully equipped to 100 A-1 class and shall be so maintained; ordinary repairs and replacements chargeable to voyage account; expenses of reclassification, of maintaining class and of major repairs, also any losses arising from inherent defects and replacement of gears and pinions in turbine vessels to be for the board's account.

Premiums and assessments for P. and T. insurance shall be charged to voyage account, but at rates not higher than the market. Insurance against fire and marine risks, including collision liability, shall be maintained by the board for its account, fully covering all concerned. In case of insured losses, the board shall make any advance of funds necessary pending collection of insurance. Liabilities for collision, personal injury, cargo damage, and other liabilities of an accidental nature are to be assumed by the board.

All expenses arising from a loss of time in excess of 24 hours and due to accident to vessel or cargo shall be borne by the board.

An audit shall be made covering an agreed period on each trade route for the purpose of fixing for that route the net result per voyage for such period. This audit shall take account of all revenue and disbursements arising from operation, but shall not include ship insurance, depreciation or interest.

DIVISION OF PROFITS AND LOSSES

The agent shall collect all earnings and pay all operating expenses, except as otherwise stated in this instrument. At the conclusion of each voyage, he shall render an account to

the board, showing the results as compared with the standard figure. The surplus or deficit thus determined shall be divided between the board and the agent. The agent shall receive no compensations for operating other than that above provided for.

PURCHASE AND BUILDING FUND

A certain percentage of any surplus paid to the board under the provisions of the preceding paragraph shall be deposited in a bank or trust company in the joint names of the board and the agent as a "Special Purchase and Building Account." At any time during the life of this agreement, this fund may, at the election of the agent, be devoted to any or all of the following purposes:

- (a) Making good the operator's losses on voyages during the term of the agreement.
- (b) Converting any vessels covered by this agreement into Diesel engine vessels.
- (c) Purchase of tonnage from the board.
- (d) Building new American tonnage for the agent's account.

If the agent does not use this fund for any of the purposes set forth, during the term of the agreement, his rights therein shall cease, except that he may apply it to build new American tonnage contracted for within a stated time after the termination or cancellation of the agreement.

HUSBANDING FEE

The board shall pay to the agent an agreed sum per vessel per month which shall be debited against the voyage account.

All agent's disbursements charged to the voyage account shall be net, and he shall derive no direct or indirect profit therefrom. Where the agent provides terminal facilities, rates and terms for their use shall be agreed upon between the agent and the board.

The agent shall have control of operations, including decisions as to rates of freight, conferences, sailing dates and personnel. He shall also supervise all ordinary repairs and replacements. He is to have the benefit of all information possessed by the board relative to the vessels and trade routes in question.

The board will not allow interference or competition on the routes covered by the agreement by any other Shipping Board tonnage nor by any vessels purchased from the board at less than full world market rates.

The board agrees to substitute for vessels which may be a total constructive loss or which have to undergo major repairs, other vessels of similar size, type and condition.

In order to provide for proper maintenance of service, and seasonal movement of cargo, the number of vessels in each trade shall be increased or decreased as traffic requires, the board agreeing, at the agent's request, to supply additional vessels or lay-up surplus ones. Vessels while so laid up shall be for the board's account and risk.

If the agent shall have been found by a board of arbitration guilty of wilful violation of this agreement, or of inefficient management, the board may cancel the agreement on 30 days' notice. The agent may cancel the agreement on 30 days' notice, if he has sustained operating losses exceeding the sum in the "Special Purchase and Building Fund" by an agreed amount per vessel operated.

The above abstracts cover the main points of the operators' plan and proposed operating agreement. Some modifications were submitted to the Shipping Board on September 13, 1923, but the proposal remains substantially as here outlined.

Shipping Legislation That We Have and That We Need

Laws Now on Our Statute Books That Would Greatly Benefit American Shipping, If Enforced—New Legislation Needed

By "Old Scotch"

BEFORE embarking on a new campaign for the American merchant marine, or for any other enterprise, it is always well to take stock of our assets as well as our needs to accomplish the end for which we seek.

The forthcoming American Marine Congress is called largely to discuss our needs for the future in maintaining a sufficient number of American ships in our foreign trade. The passage of the Jones Bill, otherwise, known as the Merchant Marine Act, 1920, was supposed to provide all necessary legislation for the time being. Circumstances, however, have made that Act, comprehensive as it then was, entirely inadequate to accomplish the policy laid down in its preamble "To do whatever may be necessary to develop and encourage the maintenance of such a merchant marine," that is a fleet of the "best equipped and most suitable types of vessels sufficient to carry the greater portion of our commerce, and serve as a naval or military auxiliary in time of war or national emergency."

This act, approved June 5, 1920, contained much that is valuable for the accomplishment of such a policy, some of which has reached fruition and some of which has progressed no further than the statute book. The principal sections among the latter are as follows:

SECTION 5. SALE OF VESSELS

"The Board is authorized and directed to sell, as soon as practicable, consistent with good business methods—all of the vessels—acquired by the Board."

This has been complied with in part, and in justice to the Shipping Board it would seem that they have acted in accordance "with good business methods," when we consider the almost universal collapse of the demands for ship tonnage, due to the terrible falling off in ocean transportation. Sales of a small amount of tonnage of desirable vessels have been made at prices approximately the prevailing world's tonnage values, which have been compatible with the almost negligible demands. No further legislation is needed along these lines, as it is presumed that the Board will take advantage of their authority as conditions change for the better, which at this time seems to be the only way they can change.

SECTION 11. CONSTRUCTION LOAN FUND

"The Board may annually set aside out of the revenues from sales and operations a sum not exceeding \$25,000,000 to be known as its construction loan fund, to be used in aid of the construction of vessels of the best and most efficient type for the establishment and maintenance of service on steamship lines deemed desirable and necessary by the Board—. No aid shall be for a greater sum than two-thirds of the cost of the vessel or vessels to be constructed, etc."

The setting aside of funds received from operations is more or less of a mirthsome provision, in the light of events subsequent to the passage of the Act, but there have been very substantial receipts from "sales" of ships and property. Singularly enough, so far as is generally known, this provision for aiding "steamship lines" has been resorted to in but one instance, and that was for the New York-Duluth service. The Board's legal talent, in approving this loan, was much more progressive than Steamboat Inspection interpretations that laws for "steamships" are not applicable to motor-driven vessels. However, there can be no question but that this sec-

tion of the Jones Act will be very helpful when the time comes for American shipowners to make investments in needed equipment as water-borne commerce picks up.

It should be noted that this loan fund is not alone applicable to new vessels in the foreign trade, as is evidenced from the fact that the only loan known to be made thus far has been to a line employed in domestic trade. As this legislation is very much akin to the farm-loan provisions of law, and as it can be used much to the advantage of our agricultural interests, as for example the loan made on the motorships which will carry large quantities of grain, butter and eggs from the Northwest to the Atlantic seaports at lower than rail rates, it should and probably will be kept on the statute books.

SECTION 21. EXTENSION OF COASTWISE LAWS TO INSULAR POSSESSIONS

"That from and after February 1, 1922, the coastwise laws of the United States shall extend to the island territories and possessions of the United States not now covered thereby—"

This is one of the most valuable of the unenforced provisions of the Jones Act, as the question of the extension of the coastwise laws to the Philippines is herein authorized. However there were certain provisos attached to the section, the principal of which provided that it would not be effective so far as the Philippines are concerned until the President issues a proclamation to "Declare that an adequate shipping service has been established."

To the mind of the layman this wording seems to present an almost impossible condition. How in the name of Heaven can any one expect American shipowners to establish "an adequate shipping service" to the Philippines without having some assurance that a proclamation will be issued. Possibly our ignorance of legal phraseology may put a wrong construction on this clause in the existing law, but there is no question in the minds of American owners but that this much desired provision of the Jones Act should be placed in operation at the earliest possible time. The Marine Congress, it is hoped, will add the weight of its influence to bringing this matter to a conclusion.

PASSENGERS ON CARGO VESSELS

Section 26 of the Act contains authority to carry not more than 16 passengers on any American cargo vessels without being held to be "passenger vessels" or "vessels carrying passengers" within the meaning of the inspection laws.

This has been taken advantage of in but very few instances, but there is no doubt but that when trade picks up and permanent routes are established, this provision of law will be of decided advantage to American ships. Business people must go where goods are to be sold, and oftentimes there may be no established passenger service to foreign ports where it is desirable to extend our foreign trade.

THROUGH PREFERENTIAL RATES TO BE ALLOWED ONLY WHEN PROPERTY OR PASSENGERS ARE CARRIED IN AMERICAN VESSELS

Section 28 of the Jones Act makes it permissible under certain conditions for the Interstate Commerce Commission to give preferential railroad rates on passengers and merchandise arriving in or departing from American ports.

This has as yet not been enforced and in the opinion of many experts can be made very advantageous to American ships. It is naturally a very complicated matter, and one in which there can be many conflicting elements. The common carriers on land do not welcome any reduction in rates, which they consider at present to be none too remunerative for the burdens placed upon them by other requirements of law. The whole subject is now being given rapt attention by officials who are interested, and out of their conclusions may yet come some reductions which will benefit shipping.

DISCRIMINATING CUSTOMS DUTIES AND TONNAGE TAXES

Section 34 of the Jones Act was the one most relied upon to furnish the inducement for private owners to operate vessels in the foreign trade. In it the President was "authorized and directed" to serve notices of intent to nullify or amend any treaty with any foreign nation, which conflicted with our right to impose preferential tonnage taxes or import duties on all but American vessels bringing goods to our shores.

Under a similar policy in the early part of the last century, the American merchant marine was fostered until it became very prosperous. A similar result was expected under the terms of the Jones Act. President Wilson and President Harding both considered that under the existing unsettled condition of world affairs it would be unwise and inexpedient to serve such notices, and hence to date it has not been done. This lack of action serves to draw attention to the fact that Congress does not get very far in "directing" our chief executive as to what he shall do in affairs of diplomacy.

Whether President Coolidge will agree to the annulment of these treaties remains to be seen, and perhaps he would be glad to hear the opinion of the Marine Congress on the subject.

Whether the treaties are modified or not has no bearing on the subject of preferential duties in the indirect trade. That is, for example, if American ships and German or English ships are in competition for trade from Brazil to the United States, there is nothing to prevent Congress from giving American ships preference, so far as customs duties are concerned, of a sufficient amount to allow American vessels to compete. Brazilian vessels would, of course, have to be given the same treatment which we accord our own vessels, and which would be eminently proper. As many important export markets of the future are likely to be with countries having little or no shipping of their own, legislation of this kind would be very valuable and should be urged by the Marine Congress, if it is again decided not to apply the principle generally to all nations.

While the above are the main legislative enactments from which benefits may be obtained, if they are invoked, the following are some of the matters needed which have been discussed as of value, and which it is hoped will be enacted into law as soon as possible. They may very well be discussed at the Marine Congress and be the subjects of finite recommendations.

RESTRICTIONS OF 50 PERCENT OF IMMIGRATION TO OUR OWN SHIPS

This is a much desired piece of legislation for the benefit of American vessels in the North Atlantic routes, as it is from European ports that the great bulk of our immigration comes. The necessary authority was contained in the original subsidy bill, and there was very little opposition to it. There was, however, some friction in the House of Representatives, as to whether or not the Committee on Merchant Marine and Fisheries, which handled the subsidy bill, should have jurisdiction over this particular item, where there was a perfectly good Committee on Immigration which claimed all such matters.

No matter how it is handled in Congress, it is of such an equitable character that it should be passed in the new Congress, as one of the costless means of benefiting our merchant marine in foreign ports.

GOVERNMENT EMPLOYEES MUST TRAVEL ON AMERICAN SHIPS

This clause was also included in the subsidy bill, and of all the many items in that ill-fated measure, it was the only one to which there was given unanimous approval. In itself it will bring no appreciable revenue to American ships, but psychologically it will be of great advantage. The example set by many high officials of the diplomatic and consular service in traveling to and from their foreign stations on alien vessels, when, as has frequently occurred, they could have traveled on ships flying their own flag, has been, to say the least, abominable. The examples they have set have had a very damaging effect on the action of American citizens, who have given foreign vessels preference in traveling abroad.

During the past summer and spring there have been an unusual number of United States senators and congressmen who have gone to Europe to study conditions over there, and to their everlasting credit, almost without exception they have selected American vessels on which to make their pilgrimages, and paid for the passages out of their own pockets. There is therefore very little doubt but that legislation will be enacted at the next session of Congress, making it mandatory for those who travel abroad at public expense to patronize American vessels wherever possible.

REVISION OF NAVIGATION LAWS

This subject is one of great importance to the successful operation of our merchant marine. Many tomes have been written on the subject, and much oratorical effort expended. Many ill-advised proponents of shipping have contended that such revision was all that we need to place our ships on the seas and keep them there. As a matter of fact, if we adopted the Merchant Shipping Act of Great Britain in toto, we would come very far from meeting success in the rivalry on the ocean; while there are certain phases of the English shipping laws which are not at all applicable to our ship operation, the present navigation laws and Steamboat Inspection Regulations should be so amended that American vessels will have no more restrictions than British vessels.

These laws and regulations have been in process of revision by Shipping Board experts for many months, and the authorities at Washington should be urged by the Marine Congress to have the revised draft submitted for action by our lawmakers as early as humanly possible.

As a general rule the less laws and regulations we have the better it will be for all concerned. The classification society should be depended upon for much of the onerous and time-consuming inspections now demanded by our Government. American vessels have more inspections than the vessels of any other nation. This not alone is provocative of delays, but in the end much money is wasted in the annual inspections of cargo vessels.

NAVAL RESERVE

It has been suggested that one way to overcome the differential in cost of crews on American vessels engaged in the foreign trade is to detail enlisted men from the authorized personnel of the Navy to man these ships under merchant officers. In view of the value of the training they receive in the operation of merchant vessels, a duty they would have to perform in time of war anyhow, it is proposed that one-half their pay be given from the naval appropriation, and the other half to be paid by the shipowners. This would effectually overcome the difference in wage costs and provide real patriotic American crews—so much needed for an efficient merchant marine engaged in the foreign trade.

How Our Navigation Laws Handicap American Ships

Codification and Revision of Marine Laws Has Received Wide Endorsement—Recommendations Filed by Special Committee on March 5, 1920, Should Be Given Consideration

By V. G. Iden

IT is generally conceded by all students of shipping that one of the fundamental handicaps under which the American merchant marine operates is found in the sundry federal laws which have been enacted to regulate shipping. In a democratic country such as the United States it has been comparatively easy for first one and then another political group to have an act put through Congress. Some of these have been "log-rolled" and some have been put through on a "trade." Politics is a tricky master and many a well-meaning idealist has found it necessary to compromise in order to accomplish even a little of what he thought was good.

Furthermore political complexion has first taken on one turn and then another. Colonial restrictions enacted by European powers resulted in counter acts by the United States. Graft resulting from the mistaken forms of state aid granted after the Civil War brought about a reaction and a counter of restriction. The sinking of the *Titanic* caused a hysteria that resulted in further restrictions on the building and equipment of ships. Then labor obtained the ear of Congress and the La Follette law was enacted.

All comes down to the one thing: That the navigation laws of the United States have, for the greater part, been the result of outside influences rather than from any urging within the ranks of merchant shipping. Little of such laws was intended to encourage American shipping, but mostly the laws were designed to prevent American shipowners from doing some specific thing. The imposition of restrictions is always a burden, no matter whether they are warranted by humanitarian motives or not.

WAR CAUSED AMERICA TO ACT

It was not until the Great War with Germany occurred that the United States awoke to the necessity of doing something and of doing it in a hurry. Naturally within such a brief space of time available it was impossible to undo all the statutes that had blighted American shipping during the previous decade. That method of recouping our maritime power was not to be thought of, so it was decided to enact the United States Shipping Board law. That law created a body which was supposed to study the shipping problem and to draft regulations and recommend to Congress new laws to aid in the upbuilding of our marine. By attaching the shipbuilding provisions to that law, which were necessitated as a war emergency, the issue was complicated.

Ever since that time the intent of the original Shipping Board Act has been clouded by government ownership and the urgency of getting some tangible good out of the fleet. A subsidy was proposed in order to encourage private operators to take over the fleet, but Congress refused to enact it. With the closing of that issue the atmosphere is once more being cleared and the time is now ripe to bring back to the attention of the public the fundamental handicaps on the private operation of merchant ships found in the navigation laws.

COMMITTEE TO STUDY NAVIGATION LAWS AUTHORIZED

On September 4, 1919, the United States Shipping Board adopted a resolution authorizing the creation of a body of

practical shipping men to study the subject of our navigation laws and to report thereon to the board. The committee was subsequently created with this personnel: P. A. S. Franklin, chairman, J. Parker Kirlin, Homer L. Ferguson, H. F. Alexander, David T. Warden, Alfred Gilbert Smith, Eugene E. O'Donnell, Andrew Furuseth, William S. Brown, Darrah de Lancey, and A. N. McGray, all men well known in the shipping industry. This committee filed its report with the board on March 5, 1920. While the report of the committee was never made public it is generally acknowledged that parts of its recommendations were incorporated in chapters which were primarily compiled and proposed to Congress for the new navigation code. Inasmuch as no comprehensive codification and revision of these laws has as yet been approached, a survey of the findings of this special committee remains the best measure of the shortcomings of the existing laws.

The present navigation laws and the regulations thereunder are to be found scattered through a large number of volumes of statutes and regulations, passed at different times. Numerous amendments have been made which repeal all acts and parts of acts inconsistent therewith. This forces a comparative study of the various statutes and regulations, if it is to be determined just what the present law or regulation on any particular subject is.

A technical committee, it has been suggested, should be authorized to draft a consolidation of the revision of the laws into a single code. It has further been suggested that the authority to make regulations under such a projected code should be vested in a single administrative body, or department of the Government. At present the authority to issue regulations under laws on merchant shipping is scattered among a number of boards and bureaus.

The reasonableness of these demands is readily apparent and in principle has been endorsed by the Government. It remains to see that the codification is made and enacted by Congress. And if the proper amendments are enacted in that code the American merchant marine, in the matter of protective law and regulation, should be placed upon a parity with the merchant ships of other maritime nations of the world.

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

Further recommendations made by the special committee relate to the enactment of a load-line law; the adoption of a resolution calling for an international conference to draft rules for the prevention of collision at sea, and the approval of the Brussels treaty dealing with the subject of liability for collisions. While these subjects are but concomitant, they nevertheless have a bearing upon the main subject and their adoption would tend to make the United States a leader in things maritime. It must also be recognized that the committee making these recommendations was one composed of representatives of labor, shipowners, operators, shippers. They represented all different business complexions. The recommendations are non-partisan and were made in the best interest of the great industry of merchant shipping under the American flag. Under such circumstances it is difficult to understand why the United States Shipping Board would hesitate for a moment in passing the recom-

mendations on to Congress and Congress halting for a moment in executing them into law.

Commerce by water is a problem which does not necessarily embrace that of a merchant marine. Water commerce depends upon the encouragement that a particular locality gives to ships to enter and clear the port. Port regulations imposed in the form of harbor dues, tonnage taxes, lighterage, dock rentals, pilotage, customs inspection, health regulations, go to make up the popularity or unpopularity of a port. Ships will naturally seek out those ports through which they can clear their passengers and cargoes with the least expense and with the greatest expedition. Those ports have the greatest steamship services no matter what flag predominates on the high seas.

It is this fact which explains to some extent why certain ports of the United States appear to be favored over others in the way of steamship connections. The fact that some ports have, in the past, been given what was thought inadequate steamship services prompted appeals for Government assistance. The United States Shipping Board, being a Government body, was naturally responsive to political importuning, and services were established out of ports which would not otherwise have boasted of a marine.

ECONOMY OF OPERATION AND NATIONAL PROTECTION DETERMINING FACTORS

But port services and a marine flying the American flag are two entirely different things. The ocean is free and trackless, except to the extent to which custom has evolved certain general trade routes. These routes have been predicated upon the place from which commerce originated and the destination to which it was going as well as upon the availability of ports through which that commerce flowed. The flag which ships fly is primarily determined by the economies of operation and the national protection permissible under that flag. American capital has invested freely in vessels flying the flag of nations other than the United States, and will continue so to invest until the navigation laws of this country are revised and codified so that all artificial restrictions are removed and our ships are given as much freedom of action under the laws as are the vessels of other nations.

If it is the popular desire to have American money invested in ships which fly the American flag, then it should be the popular desire to have statutes which encourage such investments. Liberalizations of the laws are essential, and it has been shown that such liberalization is possible without in the least destroying the safeguards to the public which our laws should be solely concerned with. A detailed study of the existing laws will show how wide of the mark they have gone.

TONNAGE MEASUREMENT RULES

Rules of admeasurement are issued by executive action under the statutes. These rules are drafted by the Commissioner of Navigation and applied by him in the manner in which he decrees the law directs him. Until the World War the rules so promulgated seriously discriminated against American ships inasmuch as certain spaces were included in the total tonnage of a ship which were not included under the admeasurement rules of other nations. It was claimed that the American tonnage was approximately five percent larger than would be the tonnage had the ship been measured under the British flag, and was even larger in comparison with German admeasurement. This meant that port fees and other taxes which are based upon the tonnage of a ship were larger in the case of American vessels than in the case of vessels flying the flag of another nation.

In respect to admeasurement, however, the correction was comparatively simple. The executive rules were changed in 1915, after the outbreak of war so patently brought to the

attention of Washington officials the necessity of considering the claims of steamship owners with more grace. Our rules now permit the exception of certain spaces subject to certain construction provisions which are clearly set forth in the existing rules. It now appears that builders in the United States are taking advantage of the opportunities offered for deductions, thus giving American ships substantially the same advantages that are enjoyed by vessels of other nations.

In 1919 the Commissioner of Navigation issued a ruling that all double-bottom spaces may be eliminated from or not considered at all in the calculations of the gross tonnage of ships. It has also been pointed out by practical naval architects that Articles 39 and 40 of the commissioner's regulations clearly provide for the deduction of propelling machinery spaces and for the addition of certain air and light spaces which entitle the vessels to a deduction of 32 percent of the entire gross tonnage. It has been recommended that the attention of owners and builders be drawn to these provisions in order that, by taking advantage of the new regulations in the preliminary designs of the ships, they may be allowed deductions which will materially reduce the net tonnage and will practically put ships under the American flag on a par with those of other maritime nations.

It would appear from these simple examples drawn from the more modern interpretations given our navigation laws that some of the serious inequalities have been removed. But it will be observed by reference to the rules that if the propelling machinery spaces are not larger than absolutely necessary for certain types of machinery now being installed, the question arises whether or no they should be made larger by increasing the light and air spaces without encroaching on the cargo spaces. In the case of bulk ships this would make a material difference in freight earnings, due to the extra cubic capacity, whereas in deadweight ships the loss in cargo space would be negligible.

MEASUREMENT COMPLICATED BY DUAL CONTROL

The law specifies that the measurement of vessels shall be done by the surveyors of customs, and further directs that the Commissioner of Navigation shall have supervision of the laws relating to the measurement. Here we have two executive departments of the Government concerned with the one thing, a situation which is always conducive to complication and inconvenience. Common sense dictates that both the "personnel" as well as the "supervision" in this case should be under the Commissioner of Navigation alone. It has furthermore been suggested with good logic that the country should be divided into "admeasurement districts" under separate supervisors, directed through one central office.

According to shipping men a load line law is especially desirable. In consultation with leading naval architects, shipowners and operators and others concerned, a model act has been proposed which has already been before Congress. This, it is felt, should be incorporated in the statutes.

It would appear that the shipping world is not averse entirely to regulation by Federal authority, although it is averse to regulations which are based upon antiquated needs and directed by statutes which should be killed by Congressional action inasmuch as they are already dead through modern usage. The law, for instance, directs that there shall be an annual hydrostatic test of marine boilers. This means that the boilers of steamships shall be subjected to a specially extra hard strain each twelve months. It would be much better to accept a test made under scientific conditions at the factory when the boiler is built and provision be made for the acceptance of a report from the classification society at the periods of survey. In case a vessel is not classed by a recognized classification society, the survey period should not exceed three years, at the end of which time the application of the hydrostatic pressure should be made if in the dis-

cretion of the surveyor or inspector this application is found necessary. A dry examination could be made yearly or oftener, if thought advisable.

Likewise the steam-pipes and boiler auxiliaries could be tested at the plant or when installed on board the vessel. A modification of the regulations in this way would be of great assistance to American ships and would, in a manner, be a step tending to cooperate with, instead of to hamper, American steamship operations. This revision would remove any possibility of prosecution under the law. Shipping men are not so narrow as to show hostility to all regulation but they want that regulation so applied as not to penalize their operations. For instance the law requires the use of fusible plugs on marine boilers. These entail an added expense but are demanded in the name of safety. Steamship owners are not opposed to this but they do criticise the numerous and perplexing regulations issued on the subject of such plugs.

NO DISCRETION ALLOWED INSPECTION SERVICE

The spirit which prompted the enactment of many of the navigation statutes of the United States was such as to evidence an inherent hostility toward shipping. That is undoubtedly why so much criticism is heard of the mandatory character of the legislation under which the Steamboat Inspection Service operates. That is also why no discretion is left to the officers responsible for the enforcement of the laws. British law permits elasticity as does the maritime law of most any other nation.

Our merchant fleet is composed of many diversified types of vessels engaged in various kinds of navigation. It is difficult to draft any mandatory type of law for general application under these circumstances. The earlier laws, which still remain a part of the statutes, related to vessels operating on inland waterways. And many of the statutes, while somewhat more modern in their intent, still could not be amended satisfactorily to cover the various types of vessels which developed from the early steamboat and which now make up our diversified merchant marine.

In the revision or recodification of the statutes, therefore the request of the steamship men that this basic fact be kept in mind appears to be wholly reasonable. They request:

First: That all steam or motor propelled vessels be classified, having regard to the particular types and trade conditions.

Second: That the laws governing classification and inspection be revised, having regard to the particular types and trade conditions.

Third: That the revised legislation give to the administrative office discretionary authority without sacrificing safety.

Fourth: That all seagoing, lake, bay and sound vessels of more than 200 tons be built under the rules and survey of the American Bureau of Shipping or similar classification society.

Fifth: In the division of vessels into groups, the rules of the Board of Supervising Inspectors and the American Bureau of Shipping will be helpful in defining the various types. As the laws governing the Steamboat Inspection Service principally cover safety of life at sea, some of the present statutes may reasonably apply to all types; in the main, however, specific statutes covering each particular group will be found desirable.

SUGGESTED THAT CLASSIFICATION SOCIETIES MAKE SURVEYS

It has been suggested that cargo vessels should be subjected to inspection at the survey periods by the classification societies abolishing the annual inspection by the Steamboat Inspection Service, which would place our laws upon a parity with those of England in this regard. At least a survey every eighteen months would appear to be adequate. All repairs and structural changes could be referred to the classification society for action at the survey period, or if considerable deterioration has actually taken place in the vessel's hull, boilers or machinery, prompt action could be taken if deemed advisable by the classification society. Passenger vessels could be subjected to an annual inspection, but the application of the hydrostatic pressure to boilers should only

be done at the survey periods and all questions of reconstruction should be passed upon by the classification society.

The imposition of so much authority in the classification societies is wholly warranted by the developments of recent years. These societies have a reputation at stake and are believed in many high quarters to be more responsible than any group of inspectors which the Government may put out by political appointment. "The time has come," said a memorial to Washington signed by the leading American shipping men, "when we might give formal recognition to the functions of the classification societies and in our opinion the closest harmony and thorough cooperation should exist between the inspection service and such societies, to the end that a successful, vigorous and efficient merchant marine may be developed." In that thought responsible trade authorities agree. The insurance companies will place their risks upon the reports of such societies and the Federal authorities might as well profit from such a practical endorsement.

A revision of the statutes made in this spirit would be of great assistance to the American merchant marine. It would be an encouragement to private ownership and operation instead of a discouragement. Furthermore these recommendations, which have so long been pending before the Shipping Board, have not only the endorsement of the American owners but likewise the endorsement of the representatives of labor.

The revisions suggested would not relieve the steamship owners of their responsibility to maintain the structural features of ships to a point that is entirely adequate for all purposes of safety. The revisions would merely relieve them of arbitrary rulings which place them at a disadvantage in comparison with the merchant ships of other nationalities, and would limit the application of such laws to times when it would interfere least with the business of the ship.

LAWS RELATING TO MANNING OF VESSELS

But a codification of the navigation laws should not be limited only to questions of admeasurement and survey, but should also embrace all the laws which have to do with the manning of ships. Our laws relating to personnel aboard ship are such as to conspire against the competency of American officers instead of jealously guarding such competency. It speaks well for the rank and file of American sea officers that they have maintained the morale and high standing they actually enjoy in the face of such conditions, when, as a matter of fact, it would be comparatively easy for incompetents to receive high rating under our method of examining applicants and of granting licenses.

It has been recommended that the laws be amended so as to impose in the Board of Supervising Inspectors the power to make rules for the examination of applicants, to determine the class and character of licenses, and formulate uniform examination papers for the use of the local inspectors who shall examine the applicants on such papers. The supervising inspectors should also have the power to revise or alter the examination papers as time and conditions may make advisable.

Under the present law applicants for licenses are examined by the local inspectors of the several districts. The examination may be written or oral. The local inspectors in each district determine the scope and extent of the examination. The result is that the examinations in the various districts are not uniform, varying in scope and difficulty according to the views of the local inspectors in each of the districts. The examinations to obtain licenses in some districts are much less difficult than in other districts. The result is quite unsatisfactory. There should be as nearly as possible a uniform standard examination required in all districts. This result could be best obtained by giving to the supervising inspectors the power to formulate examination papers on which the local inspectors examine the applicants. The local inspectors

might, in case they see fit, supplement the uniform examination papers by further examination, oral or written, as they think best, to satisfy them as to the qualification of any individual applicant. This power would take care of cases where, for any reason, an applicant may have obtained advance information of the examination questions.

Once a license is granted the law provides that it shall remain in force for the term of five years. Instead of that the license should be permitted to run only during good behavior of the officer holding it. The re-examination of masters, mates and pilots is limited under the present practice to sight, color vision and hearing, yet the license, if the applicant has passed these tests, is re-issued completely as though there had been a re-examination on the merits.

The re-examinations as now conducted are inconvenient, and consume much of the time of the shore leave of the applicants. The re-issue of licenses, which occupies a large part of the time of the local inspectors in certain ports, appears to be quite unnecessary, and to constitute an inconvenience both to those who grant and to those who receive the licenses. It has been recommended that the law be amended so as to provide for a test or examination as to eyesight, color vision and hearing which every master, mate or pilot licensed would be required to pass at least once in every five years. This examination should be made by the officers of the Public Health Service and the licensee should report the result to the inspectors, thus taking from the inspectors the entire burden of re-examining officers. Under this amendment the inspectors should be given the power to discipline as for misconduct an officer who does not report the result of the examination in accordance with the law.

LAW SHOULD INSURE GOOD MORALE

Not only should the law be drafted with the idea of insuring the competency of officers, but it should also be drafted to insure the morale of a ship's crew. This means that authority should not be undermined in any way whatsoever. The statutes should be amended so as to place on the master alone the duty of reporting to the inspectors all accidents or occurrences producing serious injury to the vessel, instead of placing the duty on all officers as is the case under the present law. It seems obvious that any accidents or occurrences producing serious injury to a vessel would be within the knowledge of the master. It would tend to decrease discipline and order lines if officers or engineers were under duty to report directly to the inspectors matters within the knowledge of the master. The statutes should provide for the suspension or revocation of licenses for failure to perform the duty imposed by such an amendment, as such dereliction would clearly be construed as misconduct.

The present law gives the local inspectors power and imposes upon them the duty to investigate all acts of incompetency or misconduct committed by licensed officers, and also to examine and try officers after such investigation has been made and charges have been preferred against them. It has been recommended to the Shipping Board that this provision of law is objectionable for these reasons:

First: It violates all principles of justice by making the same person or body both the prosecutor and the trier of an officer.

Second: An officer summoned before the Board of Local Inspectors sitting as a board of investigation is not given the opportunity or the right to be represented by counsel which is also in violation of our well-recognized standards of justice.

Third: In some of the districts such as New York and Chicago, a very large part of the time of the inspectors is occupied by the examination and trial of officers, which very greatly interferes with the execution of their other duties.

Under the present law as now administered, an officer who has committed an act which has been complained of, is summoned before the local inspectors and interrogated by them. He is not represented by counsel, with the result that information or evidence in proof of his innocence of the acts complained of is not elicited. This is obviously unjust.

Therefore, if the local inspectors see fit to prefer charges, the officer is brought to trial before the same inspectors who have investigated the charges against him and evidence taken on the preliminary investigation is used against him. It is clear that an officer cannot obtain a fair and impartial trial before a body who has already considered the evidence and preferred charges against the man. This procedure is as wrong in principle as though a man charged with crime should be tried before the grand jury that indicted him.

It is important that the investigation of charges preferred by the investigating body should be performed by or had before different officers or bodies. Therefore it has been recommended that the law be amended so as to provide that the local inspectors, after investigating acts or complaints of incompetency, etc., shall prefer charges and file them with the supervising inspector of the district, who shall convene a trial board consisting of three local inspectors, chosen from local inspectors' districts within the general inspection district, other than those who have taken part in the investigation; that such a trial board shall, after due notice, proceed with the trial of the case on testimony adduced before it, other than testimony taken upon the investigation, and that if the majority of the trial board is satisfied that the officer on trial is guilty of the offense charged, and shall recommend that his license be revoked, suspended or reduced in grade for such time as may be proper, the recommendation be transmitted to the local inspectors who preferred the charges and that they shall execute the recommendation.

MORE EQUITABLE PUNISHMENT LAWS DESIRABLE

Under the present law the inspectors have not the power to reduce a master or officer to a lower grade, as a method of punishment for misconduct. The only power the board has is to revoke or suspend the license. In case an officer is guilty of some offense for which his license should not be revoked, the only alternative that the local inspectors now have is to suspend a man's license, during which time his means of livelihood are taken away. This may in many cases be a very extreme hardship on the officer, whereas, if the local inspectors punish the man by reducing the grade of his license for a certain period of time, the officer could be adequately punished without taking away from him his means of livelihood.

The codified statutes should aim in every way to elevate the station of ship officers. That should be the animating spirit with which the laws should be rewritten. Consequently it is just as objectionable to have upon the statutes a provision of law which tends to make spies and sneaks of seamen as it is to make possible easy graft in the granting of licenses. The present law provides that one-half of the penalty for which a vessel shall be liable is to be paid to the informer. This, obviously, should be repealed, and the statutes should provide that the vessel may be seized only by leave of the United States. Such an amendment would obviate the possibility of the use of the vessel being unduly interfered with by some informer acting on his own initiative and actuated by a desire to recover one-half of the penalty.

Amendments to the navigation laws such as these, especially inasmuch as they have received such wide endorsement by all who have the least direct interest in the industry, warrant courteous consideration. A memorial to the Shipping Board asking for their consideration was filed on March 5, 1920. That memorial is now more than three years old. Nothing final and complete has been done. Still the shipping world struggles along under handicaps which might so easily be raised by legislative action. The arguments advanced for this revision and codification of the statutes are all valid. They especially commend themselves inasmuch as the revision will not redound to the detriment of the public but will actually enhance the interests of the merchant marine and thereby create a better agency to serve the public.

What Vessels Are Needed to Give the United States a Well Balanced Merchant Marine?

Will the Vessel Pay Is the Question That Must Be Answered in Determining the Character and Number of Additions to Our Fleet

By Joseph W. Powell

Former President, United States Shipping Board, Emergency Fleet Corporation

OF the various definitions of the word "balance" that appear in Century Dictionary the one that most nearly fits this application follows: "To bring into a state of equality."

The term "well balanced merchant fleet" has been used so often that it has been accepted as having a definite meaning, but a moment's reflection shows that for this to be true some standards must first be established; without this the term is meaningless.

The unanswerable argument for a merchant marine is that the national defence requires it as an auxiliary in time of war and without such aid our naval and military forces are impotent. Many other reasons may be debated, but this is axiomatic.

The next most powerful argument, to my mind, is that an American merchant marine is necessary to the proper expansion of our overseas trade. If this is accepted, a well balanced fleet must have sufficient units of various types to meet the trade requirements of the country. In fruit steamers, for the fleet under this flag, there must be tonnage to meet needs in this special trade which must be sufficient to hold America's share against the world. In oil tankers there must be enough to carry our petroleum business and to protect it against the upsets that might result from a war time withdrawal from our trade of all bulk tankers under belligerent flags. For passenger service there must be vessels of number, design and speed to meet the commercial needs of the country for communication in its foreign commerce. The United States cannot afford to have its commercial agents travel to Buenos Aires from New York, via Southampton, nor to Australia via England and the Mediterranean, nor to have this communication interrupted when other nations are at war. These ships, to meet the military and commercial needs, must *average* in size, speed, accommodations and economy, at least equal to the similar vessels of the competing nation.

WHAT A WELL BALANCED FLEET SHOULD PROVIDE

The ideal "well balanced merchant marine" that "brings into a state of equality" the various elements of that fleet, should therefore provide:

(1) Vessels of all types in sufficient numbers to meet at least the minimum of the nation's probable need

Is a "Well Balanced Merchant Marine" One That

—will meet all the war time needs of the Army and Navy by providing ample transport accommodations and ample fuel and provisions and other supplies?

—is so proportioned as to be suitable to carry some established proportion of each kind of ocean commerce, say one-half the passenger trade, one-half the fruit business, one-half the bulk cargo trade?

Would fleets meeting the above requirements be "well balanced" whether speeds were high or low, whether vessels were steam driven or fitted with internal combustion engine, whether they were old or new?

Would a fleet "well balanced" for Country A be "well balanced" for Country B?

in times when it is at war.

(2) Vessels of all types to carry on a reasonable proportion of its sea borne foreign commerce with especial regard to conditions when other nations are at war.

(3) These vessels must on the average at least equal the average of the competitor nations in design, speed, accommodations and economy.

Now no nation ever had a "balanced merchant marine" nor will such a one ever exist in this imperfect world. But with accepted principles upon which to base comparison, it is possible to draw conclusions as to the present complexion of the United States fleet. Even so, each element must be considered by itself and with not much regard to the other elements.

I do not grant, for instance, that we are now long on tanker tonnage. The recent California oil flood has filled our fleets which are today necessary to meet the nation's needs. Had less tankers been available we might be seeing foreign flag vessels plying between American ports. On the other hand, there will be general agreement that in slow, bulk cargo vessels we have a surplus beyond any possible need that many will believe should be broken up, to speed the day when world requirements and world tonnage may again come into equilibrium. Of the other elements, passenger ships, refrigerator vessels, etc., each must be measured by the accepted standard to determine what changes in its present units would produce this ideal fleet.

However, only one practical consideration finally influences this situation. Those units will be added to the fleet that offer chance of satisfactory return on the money invested. Except in so far as Government aid—now not very imminent—may foster types to meet special national needs, this consideration, and this alone, will settle the character and number of additions to our fleet.

If the United States is to compete successfully with foreign shipping, it must have ships equal or superior to those operated by foreign nations in the respective trades, and this will require a building program covering the various types of high class ships in which our merchant marine is now so deficient. —W. F. Gibbs, President, Gibbs Brothers, Inc.

Fast Refrigerator Vessels Needed for South American Trade

By Stevenson Taylor, President, American Bureau of Shipping

WE seem to be amply supplied with freighters left over from the war program. It is necessary, however, to make many of them fit present day requirements, by modernizing the propelling power in order to obtain the greatest possible efficiency.

Additional medium sized passenger ships are necessary both for our foreign and coastwise trades. These can profitably be used in extending our ocean borne commerce and will form a much desired nucleus of transports for purposes of national defense.

Although our supply of tankers is sufficient for the immediate present, it requires no stretch of the imagination

to see that in the very near future additional tanker tonnage will have to be constructed.

We are greatly deficient in refrigeration facilities for overseas requirements. In my opinion there will soon be an urgent demand for such tonnage both in our intercoastal trade and in the trade between the two great American continents. The juxtaposition of climatic conditions make an interchange of seasonal vegetables, fruits and meats very desirable to comport with the rapidly changing standards of living. This can best be accomplished by utilizing comparatively fast vessels which are provided with large refrigeration capacities.

Both Passenger and Cargo Ships of Suitable Size and Speed Lacking

By Carl E. Petersen, Naval Architect, United States Lines

A BALANCED merchant marine for the United States necessarily implies a fleet of sufficient size, composed of vessels of various types suitable properly to carry a majority of our foreign commerce; that is, our imports, exports, passenger travel to and from the United States, and immigration. Under no circumstance, should we be dependent on foreign shipping.

A detailed study of our commerce reports will indicate the number and types of vessels we require. In a general way it may be said we are sorely lacking in (a) moderately high speed passenger and mail steamers, 600 to 750 feet in length; (b) combination passenger and cargo steamers, 500 to 600 feet in length of about 16 knots speed; (c) cargo vessels of 9,000 to 12,000 tons deadweight and about 12 knots speed; (d) refrigerator vessels of 14 to 16 knots speed and (e) cargo vessels equipped with Diesel engines for propulsion.

We seem to have sufficient tankers to serve our needs for

the present; this phase of the question can safely be left to the oil producing and transportation companies.

In the North Atlantic passenger service, with which I am familiar, American flag vessels are greatly in a minority. Especially do we need to augment our tonnage in this trade with suitable types, if we are to receive and to hold our rightful share of this traffic. Putting this in concrete form we require to obtain for this objective at least three vessels, 750-footers of 20 knots speed or over; two vessels, 700-footers of about 19 knots speed; and five vessels, 600-footers of about 18 knots speed. It must, of course, be recognized that before this additional new tonnage would be ordered that (a) construction costs will have to be materially lower than those at present obtaining; (b) the navigation laws will have to be favorably revised—or the Government will have to lend moderate aid to the owner to offset the higher construction costs and the restrictive laws.

To Build Ships, First Build Up the Trade That Requires Them

By Alfred J. C. Robertson, Naval Architect, The Munson Line

A MERCHANT fleet differs in every way from a naval fleet, but perhaps in nothing more than in its dependence upon the law of supply and demand. A naval fleet must be designed to meet contingencies which we hope may never arise, a merchant fleet cannot safely be built far ahead of the existing demand. If this had been generally realized a few years ago, we would have been spared the fallacy, still prevalent in politics, that a shipbuilding program could create a shipping business. Ships are only and always a means to an end, not an end in themselves, and the only permanent and satisfactory way of building a merchant fleet is by building up the trade which requires it. The Shipping Board is in the unfortunate position of having built a cart, without the horse to move it—and horses cannot be built!

Today a considerable amount of the world's carrying trade is being performed by vessels unsuitable to their present employment, and, as long as the world's trade is suffering from the present destructive influences, it is probably better to use what implements are presently available than to forge

new ones which may be ill adapted to the future which is going to emerge.

The time will come, however, and perhaps more quickly than we can adequately prepare for it, when the surplus of usable tonnage will be absorbed and it will become necessary to build for specific purposes.

The movement of freight is the backbone of shipping, and this country has a large surplus of freighters, but the war tonnage still available was built for the one purpose of transatlantic service, with the great majority of ships over 8,500 tons deadweight. As a consequence there is a lack of the smaller sea-going vessels which are so necessary for building up trade and are able to move in and out of harbors where drafts are limited.

Again, there are comparatively few ships on the American Registry built for specific purposes such as the carriage of coal or other bulk cargoes, or the movement of lumber, steel or refrigerated or cooled cargoes.

The rapid growth of inland trade has already thrown a burden on the railroads which is being increasingly felt,

whereas gasoline and other transport appliances have tended to make railroad investments less attractive than heretofore, so that there is little hope that they will be able to expand as quickly as the demands upon them are growing. It is therefore evident that more cargoes will have to move by water and that shippers will be willing to pay for the higher speeds necessary to compete successfully with the freight lines on land.

A great increase of travel for pleasure is one of the recent developments, and where ocean travel is for pleasure, luxury in all its forms is demanded. This tendency will without

doubt direct business to those firms with the most up to date passenger ships, and along this line of development much has still to be done.

No reference is made to any specific means of ship propulsion. There is no doubt that the Diesel engine is making rapid strides, but the use of any particular means of moving our ships must be decided by engineers, who will take into consideration all the economic factors involved in each particular case. Suffice it to say that the Diesel engine has already proved its right to be considered as reliable as any other means of propulsion at present in use.

Large Passenger Ships Should Be Built for North Atlantic Service

By E. H. Rigg, Naval Architect, New York Shipbuilding Corporation

WHILE others have been busy replacing war losses in the passenger carrying field we have made a beginning in that field with our "State" classes of ships, since renamed after the Presidents. These vessels form only a nucleus, they are backed up by a number of ex-German liners, many of which are getting on in years. Our first use for all these vessels, new and old, was as troop transports, though the war ended before the ships building could be put in service.

Our most noticeable lack is in ships fit for the North Atlantic service. None of the vessels that we have, outside the *Leviathan* and a very few other ex-German ships, is really suitable; they are all small for that trade and well as they may fit in as a beginning on our Pacific and South American routes, they do not stack up well alongside the vessels that ply the North Atlantic.

In 1921, before the Society of Naval Architects and Marine Engineers, in New York, the writer suggested that serious consideration be given to a class of ships about 750 feet long for North Atlantic passenger service. This type of ship is needed to give balance to our fleets and especially to work with the *Leviathan*.

In the Spanish and again in the late war, our lack of ships fit to carry troops was such as to cause the utmost anxiety to those responsible. In the case of the Spanish war, our shipping people know full well that we had to buy many entirely unsuitable vessels. Things were different in the late war, but not thanks to the suitable ships we had meanwhile built. It should be mentioned that such few transports of our own build as were available did their jobs well, some very well.

Briefly then, we need passenger ships of the larger class and particularly some running mates for the *Leviathan*, which is operated by the United States Lines as the flagship of the American merchant marine.

As time goes on our Pacific and South American routes, especially the latter, will need improved ships, designed for these routes. The many excellent foreign liners to South America will need counterparts from New York.

Our coastwise routes have not been strengthened materially, except in isolated instances, since the war began. Many new vessels have been projected, some have been laid down and put into service; this field would appear to offer scope for new and improved types of vessels when conditions as to building costs, etc., warrant laying down new keels.

Refrigerator ships are another lack. The California fruit trade would be materially helped by some intercoastal boats running via Panama; a passenger service also could be built up and maintained with the same ships. The Hog Island "B" type ships might serve here, if equipped with refrigerating machinery and insulated holds.

There will be occasional cargo boats of special types, but no general building of this class can be expected for a few years.

Oil tankers built and in service appear ample to handle the business now offering but this branch will need ships in the comparatively near future, especially if new oil-producing fields are opened up in South America.

Our inland water borne commerce is again being developed, and the new Erie Canal, the Mississippi and other water routes are being served by modern vessels, specially designed for the routes concerned.

Special Types of Vessels Needed for Special Trades

By Hugo P. Frear, Naval Architect, Bethlehem Shipbuilding Corporation, Ltd.

THE question of rounding out or balancing our merchant marine fleet is a vital one, if we are serious, as a nation, in our desire to keep it alive and also to take full advantage of trades which demand vessels of greater economy and in many cases vessels of special types. This has been a recognized and more or less discussed problem ever since the close of the war. Anything like a satisfactory solution will demand more favorable marine laws under which to operate and much faith, courage, time and no little financing. The following paragraph is quoted from the writer's discussion of Mr. E. H. Rigg's paper on "The Design and Construction of Passenger Steamers," read before the Society of Naval Architects and Marine Engineers in 1921.

"Our new merchant marine built during the war was not based on a prearranged, well thought out program, but on a hit or miss plan, resulting in an unbalanced fleet for either war or peace service, including a multitude of vessels worth less than scrap, and very few suitable for special trades. On this account it seems evident that passenger steamers and vessels for special trades are the ones shipbuilders must depend upon in the immediate future for new orders."

A large number of wooden vessels have been scrapped and a very few sold for restricted commercial purposes. It has also been suggested to scrap all useless vessels. If this were carried out intelligently, it would simplify the problem under consideration but would not balance our fleet. It is understood that a thorough survey has been made of the vessels

composing the Shipping Board fleet, but it is not known whether or not the full report will be published or how much assistance it would be in determining what ships fall in the useless class.

Many of the better type of the general cargo vessels could no doubt under more careful design be greatly improved upon both as to hull and machinery. Much thought and labor have been expended toward substituting Diesel engines in a great many of these vessels under conditions thought to be sufficiently favorable to insure their economic operation. These improvements, however, would not even balance this part of the fleet. There are too many small vessels, and too few fast freighters. There should be a greater proportion of the larger type of freighters capable of a sea speed of not less than 13 knots, for the quicker dispatch of high class cargoes.

When the old tramp steamer came into vogue there were comparatively few special trades or few trades for which this type was not generally accepted as being more or less satisfactory in meeting all ordinary requirements. There are now so many special trades that special types are necessary to meet the more exacting conditions. Among the special types that might be suggested to round out or balance our fleet may be mentioned the following:

- (1) Some faster general cargo vessels.
- (2) Faster cargo vessels with more cold storage space.
- (3) Fast fruit steamers for coast to coast trade.

- (4) A better type of lumber vessel.
- (5) Combination lumber and steel products vessel.
- (6) A few steamers suitable for carrying locomotives.
- (7) More passenger steamers.

SUCCESS OF THE SPECIAL ORE CARRIER

That special types pay is perhaps most strikingly illustrated in the case of the 21,000 deadweight Bethlehem patent type of ore steamers, accounts of which have been published a number of times. There are five of these vessels at present bringing iron ore from Chile. Their success has so thoroughly demonstrated the advantages of this special type of ore carrier that three more vessels of the same tonnage are now under construction and will soon be in commission. This special type of vessel is equally well suited for carrying oil, or any other liquid cargo, in bulk, copper, pig iron, steel or steel manufactured products or any kind of heavy dry bulk cargo.

These Bethlehem steamers are not only the best types for ocean ore carrying but are a good example of how a special design can be worked out so that the vessel will be at no disadvantage in many other trades. With this thought in view vessels can generally be designed so that while supreme for their intended special trade yet they are at no disadvantage in at least some other lines. There is frequently a tendency to hold off on vessels for special trades on account of an erroneous assumption that it might be uneconomical to employ them, during an emergency, in any other trade.

American Passenger Vessels Should Provide Accommodations and Service Similar to Those Found in Modern American Hotels

By H. F. Norton, Naval Architect, Newport News Shipbuilding and Dry Dock Company

IT has seemed to me that we have not yet on the ocean a distinctly typical American passenger ship. The Europeans gained such headway in building ocean going passenger vessels, that we have apparently attempted rather to follow in their footsteps than to develop distinctive types of our own. Even our coastwise passenger ships bear distinct evidences of having been copied after European designs, and of course, our present greatest pride, the *Leviathan*, while a very great credit to American genius and ingenuity in her complete rehabilitation, and while up-to-date and American in many respects, is necessarily European in her general arrangement. Also in her reconditioning, many of the European details were copied or restored.

After all, an ocean going passenger ship is a floating hotel, and since on a several days' trip the passengers have no particular business on hand except to entertain and amuse themselves, or to be amused and entertained, it perhaps parallels a resort hotel rather than a metropolitan one, but partakes something of the character of both. Such being the case, there seems no good reason why the American ships should not differ from European ships as much as our modern hotels do from European hotels. The modern American hotel usually has one large space where the guests gather to converse, smoke, write and listen to the music, rather than half a dozen smaller places devoted to various matters. There is usually not a smoking room for men only. Small card rooms and tea rooms which may be occupied by private parties are sometimes provided and are found a popular feature. A gymnasium with mechanical horse, trunk vibrators, and such playthings, is not an American institution for hotels or resorts. A more desirable and typical feature would seem to be a baseball, tennis and golf cage, which apparently might readily be provided on some of the

upper decks. Personally, if there were no opportunity for anything better, I should rather have see-saws, slides and swings in the open air, such as are provided for real American children.

No modern American first class hotel fails to have at least a private toilet and lavatory in a small separate space for each bedroom, and I believe the time is coming when no ship will offer a first class stateroom without at least similar accommodations, and if a lavatory must be put in a bedroom, it should certainly be of the good honest American sanitary type, with open plumbing and not have a lot of cupboards and other contraptions around it. The old hotel idea of three or four beds in a room at a charge of about 50 cents or \$1 per bed a night has gone to the scrap heap. The modern American ship should have for all first class accommodations, single and double rooms with at least private toilets, lavatories and large size clothes closets. These closets should be large enough readily to accommodate ordinary baggage. The rooms should connect for the accommodation of families or parties. There should also be a goodly number of rooms with private baths or showers, or both, and with private sitting room attached. All first class rooms should be large enough to permit the serving of meals in the stateroom, if desired, and every ship should be arranged for this service, similar to the modern American hotel floor service.

Such accommodations will, of course, require extra charges, but I believe that the extra charges will be cheerfully met as the advance hotel rates have been met and will more than pay for the extra space. The old two and three berth staterooms will be relegated to second and third class. The coastwise operators are beginning to see this, and it is an encouraging sign.



What Part Will Motorships Play in Our Shipping?

Conversion of Certain of the Idle Shipping Board Steamers to Motorships
Will Make the Nucleus of an Efficient Privately Owned Merchant Marine

By Angelo Conti*

ACCORDING to a statement recently issued, the following vessels remained under control of the Shipping Board, as of September 1, 1923:

TABLE I.—COMPOSITION OF SHIPPING BOARD FLEET				
	Operating or Spot	Laid-Up	Total	Deadweight Tons
Cargo	365	801	1,166	8,059,632
Tankers	19	20	39	331,434
Refrigerators	2	12	14	100,949
Passenger	30	3	33	.....
Transports	..	5	5	.....
Tugs	26	9	35	.....
Damaged and obsolete....	..	40	40	297,306
Total	442	890	1,332	8,789,321

As a result of the recently completed work of the Central

cost not exceeding \$100,000 per ship. Vessels of this class are all fitted with Scotch boilers and geared turbines.
Class D—Includes vessels of good design and competitive type but fitted with machinery that will require extensive renewal, in varying degree, and are desirable hulls for conversion to Diesel propulsion. Only the best built hulls in a fair state of preservation are included in this class, in order that they may be converted, at a reasonable cost, into competitive and valuable additions to the American merchant marine.
Class E—Vessels considered in general unsuitable for American flag operation.
Class F—Vessels of obsolete types, too old to be rejuvenated or too badly damaged to be serviceable.

The following table gives the apportionment of the vessels among the various classes:

TABLE II.—CLASSIFICATION OF SHIPPING BOARD FLEET															
Class	A		B		C		D		E		F		All Classes		Total
Status	Spot and Oper	Laid Up	Spot and Oper	Laid Up	Spot and Oper	Laid Up	Spot and Oper	Laid Up	Spot and Oper	Laid Up	Spot and Oper	Laid Up	Spot and Oper	Laid Up	
Lakers	...	24	...	116	...	...	...	12	...	11	...	163	...	...	326
Cargo	309	69	...	58	18	48	27	310	...	1	...	27	354	513	867
Tankers	8	12	1	2	10	...	...	6	...	...	...	13	19	33	52
Refrigerators ..	2	3	...	...	...	3	...	6	...	...	...	...	2	12	14
Total	319	108	1	176	28	51	27	334	11	164	...	40	386	873	1,259
Total for class	427		177		79		361		175		40				

Survey Committee of the Shipping Board, these vessels have been classified under the following headings:

- Class A*—Steel vessels of good design, well built, equipped with reliable machinery and deck auxiliaries, and capable of continuous operation with normal upkeep. The estimated cost of repairs varies from a maximum of \$15,000 for lakers to a maximum of \$35,000 for all other types.
- Class B*—Of the same type as Class A, but requiring repairs and overhauling in excess of \$35,000.
- Class C*—Ships of good type, with well built hulls in a fair state of preservation, but less desirable than A and B because of deficient machinery. The latter, however, could be replaced at a

*Consulting engineer, formerly manager technical department, Emergency Fleet Corporation.

In addition to the above, all vessels of special types are classed separately as follows:

- Army transports..... 5
- Passenger vessels..... 33
- Tugs

- Competitive units in good condition.
- Includes 3 laid-up ex-German vessels.
- Wood and steel.

Omitting from consideration all vessels of special types, Table II shows 1,259 ships of all classes. Of this number, the 40 of class F will soon be relegated to the scrap heap and of the remainder, 326 are lake-built. Of these lake-built vessels, 152 have medium draft ranging from 19 to 21 feet and, as they are well built and have reliable machinery, they should eventually be absorbed by

our coastwise or West India trade. The remaining 175 lake vessels have excessive draft for coastal service and are too small for successful trans-oceanic operation. They are, however, of good construction, and, if offered for world-wide sale at a reasonable price, it is likely that a substantial number of them would be disposed of to trades in no way competing with American interests. The remaining vessel of class E is a collier, undesirable, in her present condition, for American operation.

We need then consider but 892 vessels, of which 386 are in operation or held in readiness for immediate requirements.

The majority of the active vessels are engaged in foreign trade under the mandates of the Jones Act. Unless this very constructive legislative measure is repealed, and American vessels retired from overseas commerce, the greater portion of these 386 vessels will always be required, whether under government or private control, and with the adoption of suitable policies, they should eventually pass to private ownership.

Likewise, the 195 laid-up vessels of classes A, B and C can be considered as an immediate operating reserve.

The real problem therefore centers on the disposal of the 361 ships of class D. Comprised of generally well-built hulls of competitive type, totaling 2,646,823 deadweight tons, and obtainable at nominal prices, this class represents the largest portion of the world's tonnage most ideally suitable for conversion purposes.

The following table gives a breakdown of this class:

TABLE III.—CLASS D—CARGO TYPES: 349 VESSELS—2,565,662 DEADWEIGHT TONS

No.	Av. Dwt.	Length	Beam	Depth	Draft	Block Coeff.	Load Displ.	Bale Capacity
16	9,725	395' 6"	55' 0"	34' 11"	27' 0"	.796	13,350	452,750
9	9,526	402' 0"	54' 0"	33' 9"	26' 10 3/4"	.775	12,910	491,100
38	9,433	402' 6"	53' 0"	34' 6"	26' 5 1/2"	.783	12,620	456,680
76	8,735	401' 0"	54' 0"	32' 10"	25' 2"	.785	12,225	442,880
14	8,729	410' 5 1/2"	54' 0"	30' 0"	24' 1"	.803	12,260	417,780
17	8,636	410' 5 1/2"	54' 0"	29' 9"	24' 2"	.798	12,220	417,780
29	8,394	410' 5 1/2"	54' 0"	29' 9"	22' 11 1/4"	.804	12,195	415,000
7	7,651	380' 0"	53' 2"	29' 4"	23' 8"	.786	10,732	376,600
5	6,306	340' 0"	49' 0"	28' 7 3/4"	23' 1 1/2"	.802	8,835	256,120
2	5,940	341' 0"	48' 0"	27' 3"	22' 5 1/2"	.806	8,520	265,340
112	5,300	324' 0"	46' 0"	28' 6"	22' 10"	.783	7,615	226,150
8	5,273	324' 0"	46' 0"	27' 8"	22' 6"	.78	7,350	232,000
4	5,128	320' 0"	46' 0"	26' 9"	22' 1 1/2"	.802	7,490	231,730
12	3,545	251' 0"	43' 6"	24' 2 1/2"	21' 0"	.805	5,280	161,500

TABLE IV.—CLASS D—TANKERS: 6 VESSELS, 42,187 TONS DEADWEIGHT TONS

No.	Av. Dwt.	Length	Beam	Depth	Draft	Block Coeff.	Load Displ.	Cargo, Cu. Ft.	Oil, Gallons
6	7,031	365' 0"	50' 9"	31' 3"	24' 5"	.794	10,225	48,170	2,412,390

TABLE V.—CLASS D—REFRIGERATORS: 6 VESSELS, 38,974 TONS DEADWEIGHT TONS

No.	Av. Dwt.	Length	Beam	Depth	Draft	Block Coeff.	Load Displ.	Cargo, Cu. Ft.	Capacity, Refrigerated
4	5,589	340' 0"	49' 0"	28' 7 3/4"	23' 1 1/2"	.802	8,835	51,630	207,850
2	8,370	402' 6"	53' 0"	54' 6"	26' 4 3/4"	.783	12,590	51,630	307,870

The Class "D" vessels, therefore, can be summarized as follows:

Cargo	349 vessels	2,565,662 tons dw.
Tankers	6 vessels	42,187 tons dw.
Refrigerators	6 vessels	38,974 tons dw.
Total	361 vessels	2,646,823 tons dw.

Of this number 14 have geared turbines and Scotch boilers, 262 have various makes of geared turbines and watertube boilers, and 85 have reciprocating engines and watertube boilers.

The cost of the replacements needed to make these vessels reliable and economical may be gathered from the following estimates, which were obtained by informally submitting comprehensive specifications to several leading yards and ship repair plants:

To retube a main condenser of 2,500 horsepower.....	\$6,000
To replace unsatisfactory condensing auxiliaries.....	10,000
To replace a set of 2,800 shaft horsepower cross-compound turbines, install 200-degree superheaters and effect all necessary alterations	95,000
To replace 3 watertube with Scotch boilers in a 2,500 indicated horsepower reciprocating engine, install 125-degree superheaters and effect all necessary alterations.....	100,000
To replace 3 watertube boilers with Scotch boilers fitted for 200-degree superheat, as required for 2,800 shaft horsepower cross-compound turbines	110,000

The cost of replacing the various unsatisfactory items, therefore, would range between \$110,000 and \$215,000 according to the combination of machinery.

The question now logically arises whether the above enumerated replacements would be as well justified on the score of economy as they are from the standpoint of increased reliability. At the present time the majority of vessels in operation average a fuel consumption of from 1.3 to 1.5 pounds per horsepower; turbines and reciprocating engines alike; a few a little less but many somewhat more. This is not surprising as in the case of geared turbines each 10 pound drop in steam pressure means a loss of 1 percent, each 12 degrees of decreased superheat a loss of 1 percent, while a drop in vacuum from 28 to 27 inches entails a further loss of 3 percent. In the case of reciprocating engines the unavoidable losses due to the progressive wear of main valves and piston rings are most difficult to estimate and both types of steam installations are equally adversely affected by the skill of the firemen in controlling the efficiency of combustion, the progressive sooting up of the boiler heating surface, the loss of vacuum by air leakages and warm sea water and by the failure of the engineer on watch to curtail the use of auxiliary steam or to properly utilize the surplus auxiliary exhaust.

Most of the turbines in question were designed for 50 degrees to 75 degrees of superheat and a nominal steam consumption of 12 to 12.5 pounds per shaft horsepower, and, if replaced with ruggedly-built and reliable units suited for

200 degrees superheat, a saving of from 2.5 to 3 pounds of steam per horsepower would be quite possible. In the case of a 2,800 shaft horsepower installation operating 180 days per annum such a replacement would effect a fuel improvement of 6 tons per day, or a yearly saving of \$11,900, which is about 12.5 percent on the cost of replacement. Should the boilers also need renewal the return would be but 5.8 percent on the investment; improvement of the auxiliaries would further reduce it to 5.5 percent.

In the case of reciprocating engined vessels, the replacement of unsatisfactory watertube boilers with Scotch boilers an increase of superheat from 50 to 125 degrees would entail a saving in fuel of approximately 7 percent. This means that the daily fuel consumption of the average 2500 indicated horsepower installation, could be reduced from 35 to 32.5 tons, approximately \$5,000 per annum, which would return less than 5 percent on the investment.

While opinions may differ as to the possible ultimate savings, the above figures are based on actual average performance and represent a fair estimate of what may be expected with skillful operation. It should be noted, however,

**Design 1020—Typical Laker, Over 300 Available**

Length B. P., 251'; beam, 43' 6"; depth, 24' 2";
average deadweight, 3500 tons at 21' draft

**Design 1023—Number Available, 112**

Length B. P., 324'; beam, 46'; depth, 28' 6";
average deadweight, 5300 tons at 22' 6" draft

**Design 1025—Number Available, 76**

Length B. P., 401'; beam, 54'; depth, 32' 10";
average deadweight, 8735 tons at 25' 2" draft

Design 1013—Number Available, 29

Length B. P., 410' 6"; beam, 54'; depth, 29' 9";
average deadweight, 8400 tons at 24' draft

**Design 1027—Number Available, 9**

Length B. P., 402'; beam, 54'; depth, 33' 9";
average deadweight, 9530 tons at 26' 11" draft

**Design 1019—Number Available, 17**

Length B. P., 410' 6"; beam, 54'; depth, 29' 9";
average deadweight, 8640 tons at 24' 6" draft

**Design 1037—Number Available, 16**

Length B. P., 395' 6"; beam, 55'; depth, 34' 11";
average deadweight, 9725 tons at 27' draft

**Design 1015—Number Available, 38**

Length B. P., 402' 6"; beam, 53'; depth, 34' 6";
average deadweight, 9430 tons at 26' 6" draft



that the use of higher superheated steam will require more intelligent care and will be attended by somewhat greater maintenance costs.

In the case of Diesel machinery, however, the elements affecting the economy of operation are entirely automatic and largely independent of the engineers' operative skill. The admission of fuel is under governor control so that in bad weather dangerous racing is considerably reduced and power is developed with considerable uniformity.

The relative merits of steam and motorship operation being best demonstrated by actual performance, the following comparative data on two sisterships owned by the Shipping Board should be of particular interest.

One is the twin screw motorship *William Penn* fitted with Burmeister and Wain six cylinder engines, each rated 2100 indicated horsepower at 105 revolutions per minute and with engineroom and deck auxiliaries electrically driven from three Diesel generators of 65 kilowatts each. The other is a single screw steamer, operated by a quadruple expansion engine designed for 3200 indicated horsepower at 75 revolutions per minute. Steam is supplied by three Scotch boilers and the engineroom and deck auxiliaries represent good marine practice.

Barring a slight fining in the motorship's after body, both vessels have substantially the same lines, the same general dimensions, were constructed after the war by the same yard and can be considered as typical equivalents of the two methods of propulsion.

TABLE VI.—COMPARISON OF ACTUAL PERFORMANCE, STEAMER AND MOTORSHIP

Voyage Numbers	Ethan Allen		William Penn			Total or Averages
	54	1	2	3		
No. of ports called.....	21	18	.....	.....	.....	.....
Days at sea between pilot stations.....	88.7	109	.....	107.5	.....	320.5
Total distance steamed.....	22,951	27,769	26,977	28,367	83,113	.....
Average speed between pilot stations.....	10.78	10.65	.....	10.99	10.80	.....
Total fuel at sea.....	3,220	1,419	.....	.....	.....	.....
Total fuel in port.....	1,059	93	.....	.....	.....	.....
Total fuel, sea and port.....	4,279	1,512	.....	.....	.....	.....
Miles per ton of fuel.....	7.12	19.6	.....	20.33	19.75	.....
Average daily fuel at sea.....	37.47	13.04	.....	12.98	13.13	.....
Average daily fuel in port.....	22.79	.75	.....	.....	.....	.....
Average daily fresh water.....	9.9	2.4	.....	.....	.....	.....
Total cost voyage repairs engineroom.....	3,501	None	.....	.....	.....	.....
Total cost voyage repairs deck machinery.....	None	393	.....	185.00	578.00	.....

The *William Penn* has been in operation since September, 1921, has completed three long voyages and is now nearing the end of her fourth. The above record of her performance is, therefore, of added importance as it extends over a fairly long period. In the case of the *Ethan Allen*, only her last voyage has been given as her previous showing is not quite so good; her high port fuel consumption is explained by the necessity of maintaining steam up at Kobe and Shanghai for emergency purposes, otherwise it normally varies between 9 and 10 tons daily. In round figures the relative performance of the two vessels may be expressed by stating that on one ton of fuel the motorship covers a distance nearly three times greater than the steamer.

In addition to the above noted engineroom repairs at the end of the voyage \$2,245 was spent on the steamer's heating coils for the double bottoms and deep tanks, and \$1,000 for retubing and repacking her auxiliary condenser. These figures are quoted merely to show the greater maintenance costs obtaining with steam machinery by reason of the many additional channels of expenditure.

As regards relative earnings of steamers and motorships, any comparison of value would obtain only for sister vessels plying the same routes, which would be rather a rare occurrence. In the case of the two vessels whose performances were compared in Table VI, only such items as repairs, fuel and water consumptions, etc., could be included owing to the fact that as they operate on different routes their final net returns are not directly comparable.

Lacking actual data, we have, therefore, resorted to a specially prepared comparison for which we selected the

TABLE VII.—CARGO CAPACITIES—OIL-BURNING STEAMER AND MOTORSHIP—8,560 DEADWEIGHT TONS

Range	North Atl. Ports United Kingdom		North Atl. Ports River Plate	
	Steamer	Motorship	Steamer	Motorship
Round voyage, nautical miles.....	6,700	.....	12,000	.....
Type of vessel.....	6.5	6.9	4.06	4.31
Round voyages, per annum.....	7,110	8,135	6,540	7,870
Deadweight cargo, outbound, long tons.....	7,650	8,295	7,330	8,140
Deadweight cargo, homebound, long tons.....	.....	.....	.....	.....
Total, both ways, long tons.....	14,760	16,430	13,870	16,010
Total deadweight cargo, per annum.....	95,990	113,360	56,320	69,000
Difference in favor of motorship.....	.....	18.1%	.....	22.5%
Total bale capacity, outbound, cubic feet.....	437,300	447,300	*415,300	447,300
Total bale capacity, homebound, cubic feet.....	437,300	447,300	415,300	447,300
Total bale capacity, both ways, cubic feet.....	874,600	894,600	830,600	894,600
Measurement, tons, at 40 cubic feet per ton.....	21,865	22,365	20,765	22,365
Total measurement tons per annum.....	142,120	154,320	90,800	96,390
Difference in favor of motorship.....	.....	8.6%	.....	6.1%
Mean of deadweight measurement cargoes, per annum.....	119,055	133,840	73,560	82,695
Total difference in favor of motorship.....	.....	12.4%	.....	12.4%

*Note—Steamer's deep tanks used for fuel outbound and unserviceable for cargo homeward.

TABLE VIII.—CARGO CAPACITIES—COAL-BURNING STEAMER AND MOTORSHIP—8,560 DEADWEIGHT TONS.

Range	North Atl. Ports S. E. Africa		North Atl. Ports Australia	
	Steamer	Motorship	Steamer	Motorship
Round voyage, nautical miles.....	16,760	.....	22,000	.....
Type of vessel.....	2.38	2.74	1.77	2.03
Round voyages, per annum.....	5,981	7,642	5,989	7,416
Deadweight cargo, outbound, long tons.....	6,336	8,043	5,654	7,966
Deadweight cargo, homebound, long tons.....	.....	.....	.....	.....
Total, both ways, long tons.....	12,317	15,685	11,643	15,382
Total deadweight cargo, per annum.....	29,315	42,975	20,610	31,225
Difference in favor of motorship.....	.....	46.6%	.....	51.5%
Total bale capacity, outbound, cubic feet.....	358,450	447,300	358,790	447,300
Total bale capacity, homebound, cubic feet.....	373,710	447,300	344,390	447,300
Total bale capacity, both ways, cubic feet.....	732,160	894,600	703,180	894,600
Measurement, tons, at 40 cubic feet per ton.....	18,304	22,365	17,580	22,365
Total measurement, tons, per annum.....	43,560	61,280	31,120	45,400
Difference in favor of motorship.....	.....	40.7%	.....	45.9%
Mean of deadweight and measurement cargoes, per annum.....	36,440	52,150	25,865	38,310
Difference in favor of motorship.....	.....	43%	.....	48.1%

SUMMARY OF ANNUAL OPERATING EXPENSES DUE SOLELY TO DIFFERENCE IN THE TYPE OF MACHINERY.

TABLE IX.—OIL-BURNING STEAMER AND MOTORSHIP—8,560 DEADWEIGHT. TONS

Range	North Atl. Ports United Kingdom		North Atl. Ports River Plate	
	Steamer	Motorship	Steamer	Motorship
Round voyage, nautical miles.....	6,700	.....	12,000	.....
Type of vessel.....	.....	.....	.....	.....
Wages.....	\$16,140	\$13,530	\$16,140	\$13,530
Subsistence.....	3,084	2,198	3,084	2,198
Fresh water.....	2,070	402	2,156	412
Lubricating oils and stores.....	4,326	3,178	4,395	3,176
Fuel.....	79,563	29,050	88,882	32,074
Maintenance, repairs and overhauling.....	8,000	2,000	8,000	2,000
Total expenses for engine department.....	\$113,183	\$50,358	\$122,657	\$53,390
Difference in favor of motorship.....	.....	62,825	.....	69,267

TABLE X.—COAL-BURNING STEAMER AND MOTORSHIP—8,560 DEADWEIGHT. TONS

Range	North Atl. Ports S. E. Africa		North Atl. Ports Australia	
	Steamer	Motorship	Steamer	Motorship
Round voyage, nautical miles.....	16,760	.....	22,000	.....
Type of vessel.....	.....	.....	.....	.....
Wages.....	\$21,180	\$13,530	\$21,180	\$13,530
Subsistence.....	4,508	2,198	4,508	2,198
Fresh water.....	1,950	525	1,935	525
Lubricating oils and stores.....	4,300	3,052	4,288	3,015
Fuel.....	82,860	28,925	79,950	28,265
Maintenance, repairs and overhauling.....	8,000	2,000	8,000	2,000
Total expenses for engine department.....	\$122,798	\$50,230	\$119,861	\$49,533
Difference in favor of motorship.....	.....	72,568	.....	70,328

8,600 deadweight ton "Robert Dollar" type, for the reason that 136 such similar vessels are yet available for conversion. The following are the leading particulars:

Length between perpendiculars.....	410 feet 5½ inches
Beam, molded.....	54 feet
Depth, molded.....	30 feet 2 inches

Summer load draft.....	24 feet 1¼ inches
Summer displacement	12,200 tons
Summer deadweight	8,560 tons
Total bale capacity	437,300 cubic feet
Fuel oil, settling tanks.....	80 tons
Fuel oil inner bottoms.....	990 tons
Fuel oil deep tanks.....	600 tons
Total fuel capacity	1,670 tons
Reserve feed water, inner bottoms.....	190 tons
Reserve feed water, fore peak.....	130 tons

The basic data used in the following comparisons were obtained from actual performances of a number of Shipping Board steamers of the *Robert Dollar* or similar types plying the routes under consideration, but the consumption of fuel, water, lubricating oil, stores and maintenance of propelling and deck machinery were somewhat reduced, on the assumption that the vessels would be privately operated under the most rigid supervision.

	Coal Burning Steamer	Oil Burning Steamer	Motorship
Service speed, knots.....	9	10	10
Fuel at sea, tons per day.....	45	32	10
Fuel in port, tons per day.....	11	8	.6
Fuel lay days, tons per day.....	5	3	.25
Fuel at home ports, \$ per ton.....	8.55	11	14
Fuel abroad, \$ per ton.....	7.40	14.10	...
Lubricating oil at sea, \$ per day.....	4.00	4.00	5.70
Lubricating oil in port, \$ per day.....	1.00	1.00	1.50

The data used for the motorship were based on the performance of the *William Penn*. The converted vessel was credited with an additional 10,000 cubic feet of cargo space due to the elimination of boiler casing, saddleback, etc.; and her annual overhauling period was assumed to be approximately one-half the steamers: as no time would be consumed in lengthy boiler repairs. The same time in port for loading and discharging cargo and an annual allowance of five days for bad weather was used in all cases. The machinery maintenance charges were also assumed considerably lower for the motorship, the difference being accounted for by the extra cost of repairs to boilers, deck machinery, heating coils and steaming out of fuel tanks. The following table compares the engine department payrolls for the different types of machinery, based on the present revised schedule:

TABLE XI.—ENGINE DEPARTMENT PAYROLL

Rank	Monthly Wages	Coal Burn- ing Steamer		Oil Burn- ing Steamer		Motorship	
		No.	Wages	No.	Wages	No.	Wages
Chief engineer....	\$260.00	1	\$260.00	1	\$260.00	1	\$260.00
First engineer....	185.00	1	185.00	1	185.00	1	185.00
Second engineer....	165.00	1	165.00	1	165.00	1	165.00
Third engineer....	150.00	1	150.00	1	150.00	1	150.00
Electrician	150.00	..	..	..	..	1	150.00
Oilers	72.50	3	217.50	3	217.50	3	217.50
Firemen, coal	67.50	9	607.50	..	..	..	..
Firemen, oil	65.00	..	..	3	195.00	..	..
Coal passers	60.00	3	180.00	..	..	..	..
Wipers	57.50	..	..	3	172.50	..	..
Monthly total	19	\$1,765.00	13	\$1,345.00	8	\$1,127.50	
Total wages per annum.....	21,180.00	16,140.00	13,530.00				
Subsistence @ 65c. per day....	4,507.75	3,084.25	2,198.00				
Total wages and subhist.....	25,687.75	19,224.25	15,728.00				
Excess over motorship.....	9,959.75	3,496.25	.....				

The comparative cargo carrying capacities for each route have been investigated in Tables VII and VIII, and a summary of operating expenses affected by the type of machinery will be found in Tables IX and X, all other expenditures having been omitted as they are substantially the same for both types of vessels. This assumption obtains only when equal amounts of cargo are carried; if the net additional earnings of the motorship need be computed all expenses

incidental to handling the extra cargo, such as stevedoring, brokerage, etc., should be deducted from the additional freight revenues.

The above conclusively proves the many inherent advantages of the motorship, but it should be noted that Diesel machinery, by reason of greater development costs and the higher grade materials and workmanship required in its construction, is considerably more expensive than a corresponding first class steam plant of equivalent power; the cost of an up-to-date Diesel installation being further augmented by the various electrically driven engine room and deck auxiliaries. This may be inferred from the following estimates for the conversion to Diesel propulsion of certain typical Shipping Board cargo steamers of varying sizes.

TABLE XIII.—ESTIMATED DIESEL CONVERSION COSTS OF TYPICAL SHIPPING BOARD STEAMERS

Average dwt.	5,300	7,650	8,650	9,520
No. available for conversion.....	112	7	136	63
Total dwt.	593,600	52,560	1,175,240	599,790
Total length of machinery spaces....	47' 3"	50' 0"	49' 6"	50' 0"
Average service shaft horsepower....	1,400	1,900	2,100	2,250
Average service speed, knots.....	10.5	10	10	10
Engineroom auxiliaries	14,500	19,000	21,000	23,000
Diesel generators and electrical equipment	39,500	50,000	53,000	55,000
Deck machinery	42,000	43,000	44,000	45,000
Main engine and maneuvering compr.	154,000	200,000	218,000	230,000
Removal, alterations and installation	60,000	70,000	80,000	85,000
Drydocking, scaling and painting....	6,000	7,000	8,000	10,000
Total cost of conversion.....	316,000	389,000	424,000	448,000
Approx. cost per s.h.p. of main engines	225	205	202	199
Approx. cost per dwt.....	60	51	49	47

The above figures are based on information informally furnished by manufacturers and ship repair plants for the conversion of a moderate number of vessels of each type so as to equitably distribute development costs and overheads. They cover a first-class installation throughout, with rugged and reliable engines and electrically driven engineroom and deck auxiliaries of the highest standard. They also include drydocking, scaling, and painting, but no hull repairs of an extraordinary nature. In each case due consideration was given to the major factors affecting the cost of conversion, such as size of shafting, available space and the amount of power that can be conveniently installed without expensive structural alterations.

Obviously, conversion costs could be materially reduced by retaining most of the present steam auxiliaries, supplementing them in such a way as will avoid the constant use of donkey boiler at sea, but such an arrangement would not reduce the port fuel consumption. Whether or not the economy attending a complete system of electric auxiliaries would be commensurate to its greater cost, would largely depend on trade requirements and the character and physical status of the present steam equipment.

If to the cost of conversion a purchase price of from 5 to 7 dollars per ton deadweight is added, the final cost per ton deadweight of completely reliable and economical motorships will vary from \$65 for the 5,300 deadweight ton vessels, to about \$53 for those of 9,500 tons deadweight.

These prices compare most favorably with \$35 per deadweight ton which includes approximately \$5 per deadweight ton for a complete overhauling for the best Shipping Board steam tonnage, which is from four to five years old as an average; and with the prevailing costs of from \$40 to \$45

TABLE XII.—SUMMARY OF COMPARATIVE PERFORMANCE—STEAMER AND MOTORSHIP

Route	United Kingdom		River Plate		S. E. Africa		Australia	
	Oil Steamer	Oil M.s.	Oil Steamer	Oil M.s.	Coal Steamer	Oil M.s.	Coal Steamer	Oil M.s.
Kind of fuel.....	6.5	6.9	4.06	4.31	2.38	2.74	1.77	2.03
Type of vessel.....	18.1%	..	..	22.5%	..	46.6%	..	51.5%
Round voyages	8.6%	..	..	6.1%	..	40.7%	..	45.9%
Extra dw. cargo.....	12.4%	..	..	12.4%	..	43.0%	..	48.1%
Extra meas. cargo.....	..	..	..	..	..	..	..	..
Mean of dw. and meas.....	\$62,825	..	\$69,267	..	\$72,568	..	\$70,328	..
Extra cost of operation.....	..	..	..	..	..	..	..	..

per deadweight ton for new foreign steam tonnage, depending on type, speed and trade requirements. They also favorably compare with the prevailing costs of foreign built motorships which vary from approximately \$70 to \$80 per deadweight ton. It should be noted, however, that these low prices are forced by the present depression and are accepted by shipyards in preference to closing down, and as they allow no profit to the builders they are likely to rise as the demand for new tonnage increases.

In addition to the advantages previously stated, it should be noted that for round voyages in excess of a vessel's total bunkering capacity an oil-burning steamship would be compelled to bunker the maximum capacity of her fuel tanks in order to purchase the minimum of costlier fuel abroad, thereby decreasing her cargo carrying capacity, or else purchase a greater amount abroad with correspondingly increased expenditure.

A coal-burning steamship, plying the longer routes, would necessarily bunker abroad for her return trip and will have to seek the ports where fuel is cheap, which sometimes entails long and costly detours, or else submit to the prices prevailing at the ports of call.

The converted vessel, however, can carry sufficient oil in her double bottoms to practically steam around the world, can seek the most advantageous routes regardless of her fuel requirements and is, therefore, possessed of great flexibility and potential earning power.

Neglecting, however, the additional revenue possible with the increased cargo-carrying capacity, the preceding tables show that the 8,560 deadweight ton converted vessel previously considered can be credited with a saving of approximately \$70,000 per annum, equivalent to a return of about 16.5 percent on the cost of conversion, whereas the major replacements of steam machinery already mentioned would yield returns varying from 12.5 to 5.5 percent. Therefore, the replacement of deficient turbines and watertube boilers does not appear as well justified as the conversion to Diesel propulsion.

Having thus far analyzed costs of conversion and savings in operation let us now investigate their ultimate effect when overheads and other fixed charges are taken into account. Taking for example the North Atlantic-River Plate route a previous table shows a saving of \$69,267 for the motorship over an oil-burner. Assuming equal cargoes carried, stevedoring and other operating charges not previously included would then be the same for both types and can be excluded from computation. For the purpose of this comparison the following fixed charges have been assumed for both types:

Depreciation	6	percent	per annum
Interest on purchase cost.....	6	percent	per annum
Profit on investment	10	percent	per annum
Federal taxes 12.5 percent of net revenue, or.....	1.25	percent	per annum
Insurance	4.75	percent	per annum
Total fixed charges.....	28	percent	per annum

Based on the above premises the following table was prepared to show the comparative effect of initial costs of steamers and motorships:

(a) Cost of steamer per dwt.....	30	35	40	45
(b) Investment for 8,560 dwt. steamer (a × 8,560).....	256,800	299,600	342,000	385,200
(c) Fixed charges, 28 percent of above (b ÷ 28 percent).....	71,904	83,889	95,872	107,856
(d) Excess operating expenses over motorship	69,267	69,267	69,267	69,267
(e) Total for steamer (c + d).....	141,171	153,186	165,139	117,123
(f) Equivalent investment for an 8,560 dwt. motorship (c ÷ 28 percent).....	504,200	547,000	590,000	632,600
(g) Equivalent cost per dwt. of motor- ship (f ÷ 8,560).....	59	64	69	74

The above shows that with a prevailing domestic market price for the best ready steam tonnage of approximately \$35 per deadweight ton the top price for a converted domestic motorship fully meeting the steamer's competition would be about \$64 per deadweight ton. And as previous estimates indicate that a Shipping Board steamer could be purchased and converted into an efficient motorship at an approximate

total cost of \$55 per deadweight ton it will be seen that a substantial differential is thus created that should materially assist the American flag converted vessel to not only meet the competition of new foreign steamers built at from \$40 to \$45 per deadweight ton but also of foreign motorships built at from \$70 to \$80 per deadweight ton.

But while Diesel hulls at a nominal price might induce well established shipowners to absorb some few vessels for conversion purposes, it is a well known fact that new companies are experiencing difficulty in obtaining the necessary financial assistance, the present high costs of domestic Diesel machinery acting as a further deterrent to a wider adoption of the motorship. Some reduction in production costs, however, are confidently anticipated as soon as a minimum of standardized sizes can be manufactured in adequate numbers, as American resourcefulness will then assert itself and excel as in other fields of mechanical endeavor.

Substantially all of the board's vessels thus far sold to private interests are carrying their owners' products or are being operated in protected trades, and from present indications it appears that there will be little further demand for such trades. Hence, it is logical to suppose that such new investment capital as is forthcoming will seek to absorb the board's ships operated in specific foreign services. Here, however, it will meet the formidable competition of an ever-increasing number of specially built foreign motorships and while reliable ready steam tonnage is obviously needed for maintaining these services, it is equally obvious that motorships need quickly follow, if the American owner, lacking the endless resources of the national treasury, is to survive.

CONVERSION OF CLASS "D" SHIPS SHOULD BE EXPEDITED

Therefore, the sooner low priced motorships are forthcoming the sooner will the investor's attention be engaged in the better available steamers to meet immediate demands and in the ships to be converted to meet later requirements. Every possible incentive should then be offered to expedite the efficient conversion of a large number of Class "D" steamers in order that the absorption of those in operation and in reserve may be expected to proceed in adequate ratio, otherwise those suitable for conversion would never, in their present condition, find buyers and would ultimately decay.

If, as we hope, our premises are correct, it is believed that the following measures should prove most beneficial:

- Modification of the construction Loan Fund, created under Section No. 11 of the Merchant Marine Act of 1920, so that its benefits will equally apply to the conversion of the best and most efficient type American Flag steamers into reliable and economical motorships.
- Adoption by the Shipping Board of a liberal policy that will permit competent and responsible American citizens to absorb the board's specific trade routes by the combined sale or charter of ready steam tonnage to meet immediate demands, and the purchase of hulls for Diesel conversion to meet later requirements.
- Direct conversion of an adequate number of Shipping Board steamers for the express purpose of fostering domestic Diesel development.

Measures (a) and (b) would undoubtedly render all meritorious conversion projects practically self-financing; their immediate usefulness, therefore, needs no comment.

Measure (c) logically implies the substitution of motorships for steamers on the least developed and remunerative routes. In this connection it should be noted that on October 1, 1923, thirty-six Shipping Board coal burning steamers, aggregating approximately 289,000 tons deadweight, were employed on various foreign services, some being long distance routes ideally suited for motorship operation. This measure would ultimately entail many far reaching advantages.

First. Would permit American Flag vessels to survive on the less desirable and remunerative routes, thereby making possible their eventual absorption by private interests.

Second. Would provide work for our languishing shipyards and preserve their organizations for future needs.

Third. Would develop and establish a domestic Diesel industry and eventually lead to lower production costs.

Private shipowners would then follow in the wake of the

resultant advantages, government vessels would be disposed at enhanced values, and, providing a constructive general policy is also adopted, the primary object of establishing an adequate and self-sustaining American merchant marine would be ultimately achieved.

Lighter and Cheaper Diesel Engines Must Be Developed

By J. F. Nichols

Chief Engineer, Newport News Shipbuilding and Dry Dock Company

THE part that motorships will play in the merchant marine will be determined by their success or failure to earn a greater profit in operation than steam vessels.

The advantages of the Diesel engine, especially its superior fuel economy, are well known and for some time this type of engine has been developed to the point where a number of makes are available which compare favorably with steam machinery in reliability of operation. A considerable number of installations have been made, many of which are giving satisfaction to their owners and operators. In general, however, these engines, particularly in the larger powers, are inherently so expensive for the power developed that under

the conditions at present prevailing in this country the charges due to the added first cost about counterbalance the saving in fuel so that the American owner frequently has not found it financially advantageous to build motor vessels.

What is needed is the development of a type of Diesel engine which shall be lighter and less bulky and expensive than the present accepted types. This problem is being attacked earnestly by numbers of experienced builders with excellent prospects for success and when we are able to build Diesel engines of proved reliability at costs which do not absorb their economy in fuel, we may look forward to rapid progress in the building of motorships.

The Probable Trend in the Adoption of Motorships

By W. W. Smith, Chief Engineer, Federal Shipbuilding Company

THE oil engine is in a state of development. The evolution is proceeding rapidly, and this process will probably continue for some time, judging from the history of the development of other prime movers such as the steam engine and steam turbine. It therefore seems best to consider two phases, viz., the immediate and the near futures. The following remarks are intended to apply to American vessels and conditions only.

While it is generally unsafe to forecast the future, the following opinion as to the probable trend is hazarded:

For the immediate future—a considerable amount of installations in small powers; a few of medium power, and practically none of high power; a number of conversion installations of medium power to Shipping Board vessels, and a very few in privately owned vessels.

For the near future—a large number of installations in small powers; a considerable number of medium power, and very few, if any, of high power.

The power referred to above is approximately as follows: Small, up to 1,000 shaft horsepower; medium, from 1,000 to 8,000 shaft horsepower; and high, from 8,000 shaft horsepower up.

The type of engine which will compete most successfully with the steam installation is important. The basic requirements for this are: (1) simplicity and reliability, (2) low weight, and (3) low cost.

Judging from a considerable number of estimates and comparisons, it appears that for an oil engine to compete successfully with the best steam installations of medium power, the following values for the main oil engine only can not be materially exceeded—(a) weight per shaft horsepower, 200 pounds; (b) cost per shaft horsepower, \$70.

It seems that the above requirements can be best met by the following:

(1) Simplicity and reliability. Elimination of complication of valves, valve gears, injection air compressors, tanks and piping.

(2 and 3) Small weight and cost. Providing for an impulse on the piston every stroke for medium power engines, and every other stroke for small power engines.

At present for small powers there is very little difference between two and four cycle engines with respect to weight and cost. However, it is possible that the two cycle engine may be developed further so as to give a lower weight and cost. Since there is little indication that this possibility will be realized in the near future, the two and four cycle types will be considered approximately equal.

If these basic requirements can be satisfactorily met by present or near future oil engines, the conclusion is that the best types to compete successfully are the single acting two or four cycle engine for small powers, and the double acting two cycle for medium powers.

Let us assume that reliable engines which meet the above requirements will be available in the near future. Then it would appear that the following applications of oil engines would be advantageous with respect to the net earnings of the vessel in average cases.

Class Number	Shaft Horsepower	Number of Screws	Type of Machinery*
1	Up to 1,000	1	Oil engine. S.A. — 2 C. or 4 C.
2	1,000—3,000	1	Oil engine. D.A. — 2 C.
3	3,000—5,000	2	Oil engine. D.A. — 2 C. or
		1	Steam turbine, Scotch boilers, superheated steam
4	5,000—up	2	Steam turbine, watertube boilers, superheated steam

*S.A. = single acting, D.A. = double acting, 2 C = two cycle, 4 C = four cycle.

There is of course a wide variation in the service conditions and requirements, and this will of course materially affect the selection of machinery for the specific cases. In general, the following considerations would govern the selection for the average case.

Small Powers.—Oil engine less complicated, and simpler to operate. Fuel consumption considerably less than half, and no stand-by fuel. Cost higher. Extra cost justified.

Medium Powers.—Oil engines slightly less complicated. Fuel consumption about half, and no stand-by fuel. Cost higher. Extra cost justified in most cases up to 3,000 shaft horsepower.

Large Powers.—Fuel consumption somewhat more than half. Flexibility and overload capacity less. Cost considerably higher. Extra cost not justified except in rare cases.

In general, the field for the oil engine in the near future will probably be in small and medium powers, and especially the former.

Twin Screws.—In small and medium powers the extra complication, weight and cost of twin screw installations does not pay and cannot be justified for ordinary vessels. The

basic principles in this respect are the same as for steam installations.

Diesel-Electric Installations.—Judging from many accurate estimates and comparisons, it is true beyond question that the complexity, weight and cost of Diesel-electric installations are far in excess of direct-drive. The fuel consumption is also greater. These disadvantages cannot be justified, and it is considered a mistake to use this system for ordinary vessels. For unusual conditions, and rare cases, there may be exceptions.

Motorships Reduce the Cost of Long Voyages

By A. B. Homer, Diesel Engineer, Bethlehem Shipbuilding Corporation, Ltd.

THE ultimate problem concerning us is to increase the net return on the investment required to place our merchant ships in operation, and to maintain this net return at such a figure that our merchant marine can successfully compete with those under foreign registry.

This may be accomplished in several ways; first, by reducing the investment charge; second, by reducing operating costs and, third, by increasing the amount of cargo carried per ship and hence the gross income.

Let us take up each one of the above and see of what assistance the motorship will be.

First, the cost of machinery is being kept high primarily because not enough motorships and Diesel engines have been built to permit a reduction in cost due to quantity and standardized manufacture. Operators and owners are, therefore, defeating their own ends by holding back new construction or conversion of existing ships. This applies equally well to the development and manufacture of auxiliaries, a very important item in motorship construction costs. Conversion of existing steamers to motorships, if properly carried out in quantity, and at low hull cost, should

give a reduction in the investment charge which could not be obtained otherwise.

Second, the fuel economy of the Diesel engine reduces operating costs. Here exists the greatest factor in its favor. This is particularly apparent when a motorship is operated over a long route, and, therefore, every effort should be made to operate motorships on long voyages and steamers on the short trips.

Third, the motorship will have an increased deadweight cargo capacity over a similar dimensioned steamer due to carrying less fuel oil for the same voyage distance.

It can, therefore, be readily appreciated from the above that the motorship has the inherent qualities to play a big part in the upbuilding of the American merchant marine. We need confidence, cooperation and action along constructive lines in building up our merchant marine and improving its efficiency as a competitive factor in the world's commerce.

To this end we have already been making efforts toward effecting a reduction in construction costs to reduce the investment charge, and thereby increase the net return on investment.

First Protect Our Merchant Marine, Then Develop the Motorship

By W. G. Groesbeck, Vice-President, New York Shipbuilding Corporation

MY opinion is that the Diesel engine has now been so far developed, both in the United States and abroad, that it can be regarded as a reliable type for marine purposes. With this in mind, the question remains whether, everything considered, the Diesel engine is the most available form of propulsion in a given case, having regard to first cost, upkeep, operating expense and the like. There is no general rule that can be laid down in these matters, and each case must be worked out on its merits. Personally, I believe that its field will be found in the long voyage trades. I am doubtful as to its expediency in short voyages.

Obviously what is true of American Diesel vessels is also true as regards foreign Diesel vessels; and in the world's commerce we will be confronted in motor vessels as in all other types with the differential against us due to higher building and operating costs. We cannot expect to compete with foreign flag vessels of any type unless this differential can in some way be made up.

The subsidy bill which failed last year was an effort in this direction; and was perhaps the most direct and sensible method of meeting the situation. What can now be advanced as a substitute I am at a loss to suggest. But it is obvious that we cannot compete directly, either in building or operating, with the low wages and scale of living that obtain abroad under our highly protected wages and corresponding living scale. It is true that in mass production we can sometimes do it, but ships are not built or operated in mass.

Therefore, since none of us would consider reducing our living scale and wages to meet conditions obtaining abroad, it follows that we must either protect our merchant marine as we protect everything else in this country, or abandon the idea of having one.

I have alluded above to a limited way in which the development of the motorship may be of assistance to our merchant marine. I had in mind the conversion of a certain number of the Emergency Fleet Corporation's cargo vessels to Diesel drive.

This again is a matter of dollars and cents. At present, with shipyards abroad taking work at any price to keep their organizations going, motorships can be had at very low prices; at less prices, probably, than such vessels are intrinsically worth. When the situation again becomes normal, it should be possible, if the hulls are sold low enough, to fit them out with Diesel drive and sell them at a fair profit, to the extent that there is a demand for this class of cargo carriers. The operating differential, however, would remain, as compared to foreign motor vessels.

I am very much in favor of doing this as quickly and as far as circumstances seem to allow. It would be a great misfortune, however, if in carrying out this program, we were to allow ourselves to cherish any illusions as to our having found a solution of the problems confronting our merchant marine. The real trouble and the cure I have, perhaps somewhat crudely, pointed out.

Competition in Overseas Shipping Must Be Met By Using More Efficient Ships and Propelling Machinery

By A. S. Hebble, Superintending Engineer, Southern Pacific Company, Atlantic Steamship Lines

IF we are to keep pace with our competitors in the ocean carrying trade of the world, we must meet them with efficient ships capably manned and well adapted to the trade conditions in which they are engaged. It requires but little study to see that this can only be accomplished by the construction of modern motorships on account of their low fuel consumption and long steaming radius in comparison with steam driven ships.

There are approximately two million tons of motorships in service and under construction. Having in mind that a very small portion of this is under the American flag, it is obvious that the motorship is finding great favor with our competitors and that unless we expect to see our flag disappearing from the seas we must resort to the most efficient type of both ship and propelling machinery.

Motorships are most advantageous on long voyages on account of their ability to carry a sufficient amount of fuel for a long return voyage. This enables the owner to buy his

fuel at cost where the most advantageous prices are obtainable. They also have an advantage in that they consume less fuel per day and consequently carry less weight of fuel for a given voyage which results in increasing the deadweight and thereby adding to the earnings by being able to carry more cargo.

It is to be regretted that the cost of motor propelling machinery is greater than steam propelling machinery. This results in increased depreciation, interest and insurance charges. This is a condition however that must be met by the Diesel engine manufacturer. The cost of Diesel engine construction could be materially reduced through standardization and by putting Diesel engine construction on a manufacturing instead of a building basis as is now the case.

Properly designed motorships, with reasonable care and when operated with suitable fuel and lubricating oils, are operating consistently and economically as is shown by numerous records now available.

Legislation Should Be Enacted Making the Shipping Board Loan Fund Available for the Conversion of Existing Tonnage into Motorships

By Lewis R. Ford, Manager, Diesel Engineering Department, Morse Dry Dock and Repair Company

THE present disturbed condition of international credit and exchange has not only reduced the volume of marine business and curtailed the profit possibilities in ship operation but has also accentuated the handicap imposed on American ship operators by the difference in cost in foreign countries and the United States of all items entering into operating expense.

It is only by the application of a high degree of professional skill and business acumen that the American shipowner, thus handicapped, can operate steamers in competition with foreign vessels of the same type, but the situation becomes most acute when these steamers must compete against the rapidly growing fleet of economical foreign motorships. The establishment of an American motorship fleet is the obvious way out of this situation, but the great difference between the construction cost of new hulls in the United States and in foreign countries seems to prohibit the production of new tonnage in this country. It is possible, however, to put high class motorship tonnage afloat at a very low cost per ton by utilizing the several hundred good Shipping Board hulls that are available for purchase at a nominal price. Careful investigation has definitely developed the fact that such hulls can be purchased, converted and put into service at a cost of \$40 to \$50 per deadweight ton, depending on the completeness of conversion.

Only a few such conversions are now being made because under present conditions, financing a conversion project of any magnitude is almost impossible. If ship bonds and mortgages could be distributed to investors throughout the whole country as readily as similar railroad securities, few banks would hesitate to lend financial assistance to the numerous firms and individuals who are eager to make Diesel conversions. Unfortunately the American investor does not take kindly to marine securities.

It seems then that the most practical step toward improv-

ing the efficiency of our merchant marine as a competitive factor in the world's commerce is to unlock the loan fund of the Shipping Board and make it available for Diesel conversion purposes. This loan fund was created by Congress about two years ago to encourage private interests to build new ships but during the two year period that the fund has been available, only two new Diesel ships have been built with its aid, and these were of a very special type to which the conversion method is not applicable.

Every person with the interest of the American merchant marine at heart should use every effort to demonstrate to our national legislators, individually and as a body, the wisdom of immediately passing an enabling act that will permit the Shipping Board to lend money out of its present loan fund for converting existing steamers to Diesel drive as well as for building new ships.

Steady Increase in Tonnage of Sea-going Motorships

THE world tonnage of full-powered ocean-going motor ships (2,000 gross tons and over) aggregated nearly 1,000,000 tons on June 30, 1923—an increase of about 4 percent over the total on June 30, 1922, according to a study by B. V. York of the Transportation Division of the Department of Commerce. Vessels of British, Danish, and American nationality show a slight decrease, compared with the 1922 figure. Germany has shown the most rapid increase in tonnage. The three Scandinavian countries, however, have almost equal amounts.

Motorships of 5,000 gross tons and over increased 10 percent, amounting to 664,735 gross tons—two-thirds of the total. Countries owning vessels of this class maintain almost the same relative position as under the 2,000 ton classification.



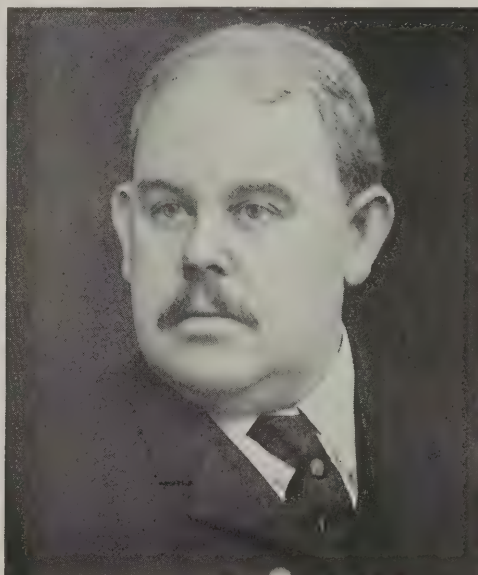
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Herbert Hoover

Honorable Herbert Hoover, Secretary of
Commerce, will open the American Marine
Congress in New York on November 8.



Colonel E. A. Simmons
Chairman Central Committee



Walter M. McFarland
Chairman Administrative Committee

Great Congress to Feature Marine Week of 1923

Marine Congress, Conventions and Exposition to Play Important Part in Determining Future of American Merchant Marine

MARINE Week of 1923, from November 5 to 10, in New York city, will bring together the varied interests of the country which directly or indirectly depend upon shipping in the conduct of their affairs. The Marine Congress to be held at the Waldorf-Astoria during this week has as its primary object the co-ordination of these interests into a body through whose deliberations it is hoped will be found a basis upon which the American merchant marine can be operated in an economically satisfactory manner and in a way to increase the competitive capacity of American ships.

The Congress is being held on the invitation of the American Marine Association whose members are convinced that American shipping can best be served by the combined efforts of the representatives of the marine industry and of all allied industries directly or remotely interested in water transportation. The result is that practically every section of the United States is to be represented by delegates from 97 organizations including chambers of commerce, port authorities, farm organizations and representatives of the various industries engaged in manufacturing for export and the like.

The organization of this national movement has been in the hands of an administrative committee, and a central committee supported by twenty sub-committees which have been instrumental in developing the policies upon which the congress will function.

PURPOSE OF THE CONGRESS

No general policy has been decided upon by the committees, but they are asking the co-operation of all groups

and classes of people interested in shipping to assist in developing a program during the congress that will be generally satisfactory to all industries. With such a program, having the support of the various organizations participating, it is felt that the Administration and the United States Congress will be greatly influenced in establishing a concrete national shipping policy. Party politics and matters of a controversial nature, however, are to be barred from the Marine Congress.

A number of lines of activity have been decided upon which tend to show the trend of thought and effort that will be put into this movement. All of these divisions of activity are aggressive in the defense of American shipping.

As stated in the preliminary committee reports of the Congress, the object shall be:

To urge, sponsor and recommend the modification or repeal of statutory restrictions or laws which tend to burden the world-wide competitive capacity of American ships, but at the same time maintaining or establishing all necessary restrictions as pertain to the safety of passengers and crews, protection of goods and protection of rights, quarters and living standards of American crews.

To recommend the adoption of such new legislation as will increase the world-wide competitive capacity of American ships.

To recommend and urge such necessary modifications and changes in the steamship code as may be advantageous.

To develop and recommend such aid as will permit of an advantage in favor of building and repairing in American shipyards, with American labor and materials.

To recommend such standardization of construction and operation as will tend to reduce operating costs and increase competitive capacity.

To recommend and urge the repeal of such legislation as permits



Robert S. Alter
Chairman, Manufacturers' Committee



R. H. M. Robinson
Chairman, Steamship Owners and Operators Committee



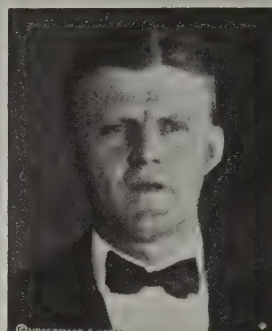
H. H. Raymond
Chairman, Coastwise Shipping Committee



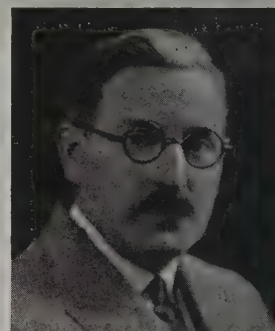
Edward B. Lyman
Chairman, Ports and Terminal Committee



A. A. Schantz
Chairman, Great Lakes Shipping Committee



R. D. Gatewood
Chairman, Standardization Committee



William H. Kelley
Chairman, Towing and Lighterage Committee

of government agencies (such as navy yards) competing with private enterprises (such as private shipyards).

To consider and make recommendations concerning government-owned ships or lines competing with private ownership.

To consider the advantage of reciprocal agreements with foreign lines on both outgoing and incoming shipments.

COMMITTEES OF ORGANIZATION

As noted above, the general plans for the development of the Congress have been in the hands of an administrative committee whose chairman is Walter M. McFarland, Babcock and Wilcox Company, New York, under the guidance of which the various sub-committees have been organized and put into operation as follows:

Central Committee, Edward A. Simmons, president American Marine Association, chairman.

Delaware River and Pennsylvania District Committee, Hon. J. Hampton Moore, Mayor of Philadelphia, honorary chairman.

Hampton Roads Committee, Capt. William H. Stayton, Baltimore Steamship Company, chairman.

South Atlantic States Committee, R. S. MacElwee, Commissioner Port of Charleston, S. C., chairman.

Mid-West and Mississippi River District Committee, Malcolm Stewart, Secretary Mid-West Farmers and Manufacturers' Conference, Cincinnati, chairman.

Great Lakes District Committee, Hon. Wm. E. Dever, Mayor of Chicago, honorary chairman.

Pacific Coast Committee, C. F. Gorman, traffic agent Port of Seattle, chairman.

Port of Greater New York, Hudson and State Waterways Committee, Charles H. Potter, president U. S. Ship Operators' Association, chairman.

Publicity Committee, W. A. Cather, Worthington Pump and Machinery Corporation, director.

Radio Committee, E. B. Mallory, Westinghouse Electric and Manufacturing Company, chairman.

Shipyards Committee, J. H. Mull, president Wm. Cramp & Sons Ship and Engine Building Company, Philadelphia, chairman.

Diesel Engine Committee, Rear Admiral Wm. S. Benson, Commissioner United States Shipping Board, Washington, D. C., chairman.

Manufacturers' Committee, Robert S. Alter, vice-president American Tool Works Company, Cincinnati, chairman.

Agricultural Committee, George M. Carey, Omaha Chamber of Commerce, chairman.

Steamship Owners and Operators' Committee, R. H. M. Robinson, United American Lines, chairman.

Coastwise Shipping Committee, H. H. Raymond, Clyde Steamship Company, New York, chairman.

Inland Waterways Committee, Hon. J. Hampton Moore, Mayor of Philadelphia, chairman.

Ports and Terminals Committee, Edw. B. Lyman, Passaic River Improvement Association, chairman.

Great Lakes Shipping Committee, A. A. Schantz, president Detroit and Cleveland Navigation Company, chairman.

Standardization Committee, Capt. R. D. Gatewood, United States Shipping Board, chairman.

Marine Insurance and Classification Committee, S. D. McComb, manager Marine Office of America, chairman.

Transportation Committee, Charles M. Muchnic, American Locomotive Sales Corporation, chairman.

Towing and Lighterage Committee, William H. Kelley, Flower Lighterage Company, chairman.

Banking Committee, Julian W. Potter, president The Coal & Iron National Bank, New York, chairman.

Exports Committee, Myron W. Robinson, president American Export Association, chairman.

Imports Committee, Frederic B. Shipley, Shipley-Hollis Company, chairman.

Entertainment Committee, Wm. Z. Gardner, president The Propeller Club of the Port of New York, chairman.

Exposition Committee, E. M. Roberts, Crane Packing Company, chairman.

Hotels Committee, Norris R. Sibley, McClave-Brooks Company, chairman.

Banquet and Entertainment Committee, H. W. Parsons, Powers Specialty Company, chairman.

Accommodations Committee, Chester M. Roe, New Jersey Asbestos Company, chairman.

The complete personnel of the Administrative Committee is as follows: Walter M. McFarland, chairman, Babcock and Wilcox Company; Frank J. Shipman, vice-chairman, The Texas Company; K. Warren Heinrich, secretary,



Winthrop L. Marvin
Vice-Chairman Central Committee



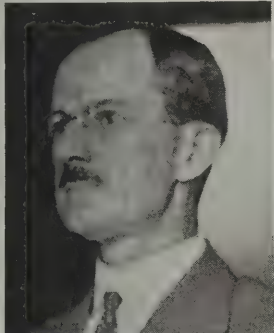
K. Warren Heinrich
Secretary Administrative Committee



Frank J. Shipman
Vice-Chairman, Administrative Committee



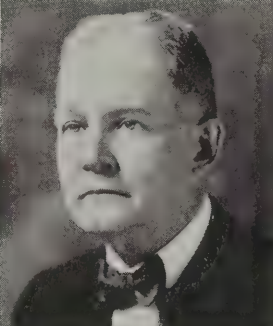
Jas. E. Plummer
Member, Administrative Committee



Hon. J. Hampton Moore
Honorary Chairman, Delaware River and Pennsylvania District Committee



W. P. Smith
District Chairman, Delaware River and Pennsylvania District Committee



William H. Stayton
Chairman, Hampton Roads Committee



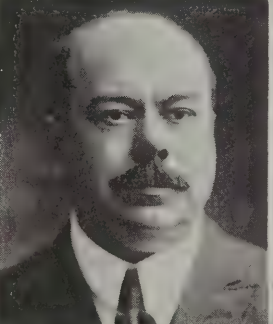
R. S. MacElwee
Chairman, South Atlantic States Committee



Hon. William E. Dever
Honorary Chairman, Great Lakes District Committee



F. C. Bradbury
District Chairman, Great Lakes District Committee



Charles H. Potter
Chairman, Port of Greater New York, Hudson and State Waterways Committee



E. B. Mallory
Chairman, Radio Committee



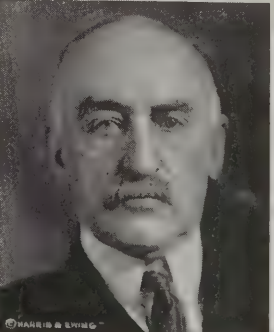
Hon. Theodore Roosevelt
Member Radio Committee



Admiral W. E. Reynolds
Member Radio Committee



J. H. Mull
Chairman, Shipyards Committee



William S. Benson
Chairman, Diesel Engine Committee

American Marine Association; Charles F. Scott, General Electric Company; James Plummer, Newport News Shipbuilding and Dry Dock Company; Edward A. Colson, Babcock and Wilcox Company; Frank W. Sterling, The Sterling-Cooper Corporation; W. A. Cather, Worthington Pump and Machinery Corporation.

The complete personnel of the Central Committee is as follows: Edward A. Simmons, chairman, president American Marine Association; Winthrop L. Marvin, vice-chairman, vice-president American Steamship Owners' Association; K. Warren Heinrich, secretary American Marine Association; Hon. Herbert Hoover, Secretary of Commerce; Alfred Gilbert Smith, president American Steamship Owners' Association; Charles H. Potter, president U. S. Ship Operators' Association; John Dowd, vice-president Maritime Association of the Port of New York; Frederick A. Russell, president New York Tow Boat Exchange; H. A. Magoun, president Atlantic Coast Shipbuilders' Association; Homer Ferguson, president Council of American Shipbuilders; Capt. C. A. McAllister, Society of Naval Architects and Marine Engineers and vice-president American Bureau of Shipping; Capt. John F. Milliken, secretary Neptune Association; William Livingstone, president Lake Carriers' Association; Matthew Hale, president South Atlantic States Association; Myron W. Robinson, president American Manufacturers' Export Association; John E. Edgerton, National Association of Manufacturers; O. E. Bradfute, president American Farm Bureau Federation; E. E. Spafford, State Commander, American Legion.

The personnel of the various committees includes many prominent men from all sections of the country; for example, there are the mayors of six cities on the Delaware District Committee; the mayors of four cities on the Great Lakes District Committee; Admiral Benson is chairman of the Diesel Engine Committee; J. H. Mull, president of William Cramp and Sons Ship and Engine Building Company, is chairman of the Shipyards' Committee.

The Congress itself will convene on Thursday morning, November 8, and will hold morning and afternoon sessions on that day and Friday, November 9. All the sessions of the Congress will be open to any individuals interested in the matters being discussed.

The Honorable Herbert Hoover, Secretary of Commerce, will preside at the opening session of the Congress on Thursday morning, November 8, and the following sessions will be presided over by prominent individuals representing the major groups taking part.

EXTENSIVE RADIO PROGRAM PLANNED

Coincident with the calling of the Congress it is planned to have sixteen or eighteen of the principal high power broadcasting stations distributed over the country take part in a general program prepared and directed by the radio committee.

To disseminate the thoughts and opinions of the leaders in various industries, associations and other institutions composing the Congress, radio will be used for the first time in an organized nation-wide program.

E. B. Mallory, chairman of the radio section of the Associated Manufacturers of Electrical Supplies, one of the seventy-eight national organizations participating in and endorsing the Congress is chairman of the radio committee of the Congress. To insure the successful and broad dissemination of an adequate knowledge of the needs of the nation, prominent Government and industrial executives are contributing their support and effort toward the success of the plan by serving as members of the radio committee. The membership of this committee includes:

Hon. Herbert Hoover, Secretary of Commerce.
General Pershing, U. S. A.
Theodore Roosevelt, Assistant Secretary of the Navy.
Admiral Benson, United States Shipping Board.

Rear Admiral Reynolds, United States Coast Guard.
A. H. Griswold, vice-president, American Telephone and Telegraph Company.

Major General Harbord, president, Radio Corporation of America.

H. P. Davis, vice-president, Westinghouse Electric and Manufacturing Company.

J. G. Barry, vice-president, General Electric Company.

Powell Crosley, Jr., president, Precision Equipment Company.

Eugene McDonald, president, Chicago Radio Laboratory.

and others of prominence.

The chairman has appointed subcommittees of the general committee in charge of programs, broadcasting stations and publicity, and sectional committees in each broadcasting center to have immediate charge of the activities at those points, and plans are rapidly being formed to use radio for the first time as a means of disseminating knowledge to the entire nation.

MARINE CONVENTIONS DURING THE WEEK

The nation-wide interest created in the Marine Congress will undoubtedly bring every man of importance in the shipbuilding and operating industries to New York during Marine Week and will add materially to the attendance of the annual meetings of various marine societies which will be held during the week.

The principal meeting will of course be that of the Society of Naval Architects and Marine Engineers, which will be the thirty-first general meeting of the Society. This year the meetings will be held in the Engineering Societies building, 29 West 39th street, on Thursday and Friday, November 8 and 9. Professional sessions will begin at 10 A. M. each day.

The program of the meetings was published on page 590 of our October issue.

During the week the American Steamship Owners' Association, the United States Ship Operators' Association and the Atlantic Coast Shipbuilders' Association will also hold meetings.

MARINE EXPOSITION

It is expected that the interest created in the Marine Congress will greatly influence the success of the Marine Exposition which will be held November 5 to 10 at the Grand Central Palace under the auspices of the American Marine Association. The exposition will be open daily from 12:30 noon to 10:30 P. M. Various special attractions will be provided daily and the delegates to the Congress will find the exhibits of both general and educational interest. The two previous annual expositions held by the association showed an excellent attendance of those individuals connected with the marine industry. This year, with the greatly increased gathering of interests both directly and indirectly depending on shipping, the exposition, featuring as it does every phase of transportation by water, will be a greater success than ever.

INSPECTION TRIPS

Through the courtesy of the steamship owners and operators and the United States Government arrangements have been made to show the delegates to the Congress as much as possible of ships and shipping while they are in New York.

The United States Navy Department has ordered the U. S. S. *Colorado*, the latest super-dreadnought of the Navy, to New York to be open for inspection during this week. Numerous of the larger passenger vessels of our merchant marine will also be open for inspection as well as the piers and terminals about the port. Visiting delegates will be given an opportunity to inspect all types of merchant vessels, including cargo vessels, oil tankers and passenger ships. Included in this group of merchant vessels, will be the flag-

(Continued on page 694)

Who's Who At the Exposition—

A Directory of Exhibiting Companies, Their Representatives, Products and Where to Find Them

Ajax Rope Company, Inc., 149 Broadway, New York.—Representatives: R. S. O. Lawson, M. L. Chapman, Chester Woodnorth, John White, Milton Mintzer, Russell Robb, Benjamin C. Hill, Norman Rounds. Booth 44.

Akimoff Propeller Company, Harrison Building, Philadelphia, Pa.—Diagrams, photographs and models of propellers, all built upon the "circulation" theory. Representatives: N. W. Akimoff, Dr. S. E. Slocum. Booth 67-B.

American Brass Company, Waterbury, Conn.—General copper and brass products for marine work; Admiralty condenser tubes; tobin bronze rods and shafting. Representative: L. B. Comstock. Booth 90.

American Car & Foundry Company, 165 Broadway, New York.—Berwick electric metal heaters. Representatives: F. C. Cheston, W. M. Earl, D. B. Wallace. Part of Booth 85.

American Steel Foundries, Chicago, Ill.—Booth 52.

Asbestolith Manufacturing Company, 1 Madison avenue, New York.—Samples of flooring. Representatives: R. C. Burnside, Miss B. V. Ross. Booth 97.

Ashton Valve Company, 161-179 First street, Cambridge 41, Boston, Mass.—Main boiler pop safety valves; smaller pop safety valves and relief valves; pressure and vacuum gages, gage and boiler testing outfits and large size marine whistles. Representatives: C. W. Buckelew, C. W. Ulrick, C. D. Moth-eral. Part of Booths 18 and 19.

Babcock & Wilcox Company, 85 Liberty street, New York.—Full size sectional model of Babcock & Wilcox 4-inch tube boiler; various boiler valves and fittings; sections of boiler headers; a working exhibit of the concentration salinity indicator; full size model of various Babcock & Wilcox design oil burners, among which will be the latest type oil burner, namely, the "Mayflower"; new boiler water testing outfit which will include a test for alkalinity. Representatives: C. W. Middleton, J. H. King, George H. Daniels, John Coleman, A. Ross Mackay, James Graham, Edw. A. Colson. Booths 76 and 77.

Beaver Tile, Inc., 442 West 42nd street, New York.—Beaver cork composition tile, a deck covering for all passenger accommodations and a new deck covering for steel decks to be used as a basis for other materials; Linomosaics, a new craft in decorative wall panels. Representative: A. N. Newell. Booth 11.

Bethlehem Shipbuilding Corporation, Ltd., Bethlehem, Pa.—Standard line of Bethlehem-Dahl oil burners with assembled unit of heaters and pumps; burner will be shown in operation using light oil and water; several Bethlehem-Weir pumps, including a turbo feed pump and a reciprocating pump in operation; also a new direction indicator developed by the Union Iron Works plant of the company in connection with engine room telegraphs. Representatives: A. W. Christian, G. A. Richardson, G. E. Laurence, G. W. Grove and F. K. Steinrock. Booth 68.

Briggs Engineering Works, 227 24th street, Brooklyn, N. Y.—"Burwell" fuel oil pumping and heating set, air register, oil burner, duplex strainers. Representatives: W. E. Yandell, C. N. Wheeler, H. M. Kuppinger, H. B. Patterson. Booth 104.

Brown Instrument Company, 50 Church street, New York.—Pyrometers, indicating and recording; recording thermometers and pressure gages; draft gages; resistance thermometers; automatic temperature control and automatic signaling equipment; salinity meters for boiler feeds and evaporator measurements; electric CO₂ recorders; electric tachometers—indicating and recording. Representatives: G. W. Keller, A. E. Keeler, J. D. Andrews, E. Schneider, C. L. Simon, M. M. Watkins. Booth 65-B.

Brunswick-Kroeschell Company, New Brunswick, N. J.—Brunswick marine type direct-connected ammonia compressor. Representatives: William O. Whitney, William Carpenter. Booth 93.

Burmeister & Wain, 27 Whitehall street, New York.—Representatives: S. M. Petersen, R. L. Larsen, H. C. Hallings. Booth 86.

The Coen Company, 50 Church street, New York.—Complete oil burning system piped up to show the different component parts ready for operation; new design "ELR" swing type air register firing front and burner set; also steel construction easy cleanable fuel oil heater; latest design type "A" burner with its self-seating holder; fuel oil strainers, also strainers especially adapted to Diesel engine work. Representatives: W. M. Wampler, G. H. Ord, H. B. Chamberlain, F. S. Harper, F. Hall. Booth 79.

J. A. Coffey Engineering Corporation, 1650 Broadway, New York.—Sample floor, miniature carfloat and photographs for exhibition. Representatives: Miss Adele Eckstein, C. H. Alexander, J. A. Coffey. Booth 12.

William Cramp and Sons Ship and Engine Building Company, Philadelphia, Pa.—Diesel engine, marine steam turbine, reduction gear, bronze castings. Representatives: W. P. Smith, C. D. Cramp, C. R. Peterson, J. C. Shaw. Booths 70 and 71.

Crane Company, 836 South Michigan avenue, Chicago, Ill.—Complete line of steel material for all pressures, 150 pounds working pressure to 3,000 pounds working pressure inclusive; complete line of steel material showing representative line of marine valves and fittings. Representatives: F. C. Bradbury, G. E. Barker. Booth 66.

Crane Packing Company, 53 Park place, New York.—A model condenser on which a continuous test will be made; entire line of packings for general marine work. Representatives: J. N. Walton, E. M. Roberts, C. W. Bryden. Booth 227.

The De Laval Separator Company, 165 Broadway, New York.—Three sizes of De Laval oil purifiers, Nos. 200, 300, 600, assembled complete; three purifier bowls, showing results of the process. Representatives: P. F. Miller, D. F. Miller, Allan Hopper, H. H. George, E. V. Mayhill, M. A. Monroe. Part of Booth 85.

Diamond Power Specialty Corporation, Detroit, Mich.—Diamond model B rear end soot blower for Scotch marine boilers, model BBM rear end front operated blower for Scotch marine boilers, model G 2 M revolving soot blower for marine watertube boilers, Valve-in-Head soot blowers for marine watertube boilers, model G 2 soot blowers for watertube boilers. Representatives: L. W. Nones, Robert June. Booth 74.

Diehl Manufacturing Company, Elizabeth, N. J.—Ventilation blowers, motor driven; desk fans, ceiling fans, exhaust fans and motors for general shipboard use. Representatives: M. W. Buchanan, W. E. Fey, J. R. Marvin, J. G. Levy. Booth 31.

O. M. Edwards Company, Inc., Syracuse, N. Y.—Marine sash or glass balancing device. Representatives: J. J. Edwards, A. J. Horgan. Booth 15.

Electric Storage Battery Company, Philadelphia, Pa.—Wireless battery for service on shipboard; radio batteries—both A and B—such as would be used for the reception of broadcast entertainments in homes or aboard private yachts; a gigantic submarine cell; a "shadow-box" showing an oil painting of an industrial scene, calling attention to the manner in which Exide-Ironclad batteries are serving the shipping industry; batteries used for ignition and yacht lighting are also shown. Representatives: E. F. Kullberg, A. C. Ferdon, R. E. Kearney, J. W. Weight, J. Carey, M. T. Ford, J. L. Fuller. Booth 31.

Electro Sun Company, Inc., 161 Washington street, New York.—Phases of blue and black printing and photo-printing that will interest marine men; display of Lefax system. Representative: A. L. Weil. Booth 253.

Falk Corporation, Milwaukee, Wis.—Flexible couplings;



Main Floor of Marine Exposition, Grand Central Palace, Lexington Avenue and 46th Street, New York City

small double reduction gear unit; moving pictures of geared oil engines and photographs of marine gear installations. Representatives: M. P. Fillingham, W. O. Beyer. Booth 87.

L. W. Ferdinand Company, 152 Kneeland street, Boston, Mass.—Jeffery's marine glue; Linoleum and tile cements; Century products. Representatives: August Schlueter, L. W. Ferdinand and L. C. Herring. Booth 228.

Fire Detecting Wire Corporation, 2 West 45th street, New York.—Four standard control panels in operation complete with fire stations, gongs, etc. Representatives: W. H. Garrison, C. Van Zandt, S. C. Zabriskie. Booth 335-336.

Foster Marine Boiler Corporation, 111 Broadway, New York.—Complete detail parts of Foster marine superheaters and a section of the new Foster marine economizer. Representatives: H. W. Parsons, R. L. Lovell, J. J. Nelis. Booth 101.

General Carbonic Company, 542 Fifth avenue, New York.—Cylinders containing CO₂ gas so connected with fire-detector as to demonstrate the effectiveness of carbonic gas as a fire extinguisher aboard vessels. This method is known throughout marine circles as the Lux System. Representatives: A. McKinny, H. R. Minor, C. W. Wardell. Booth 49.

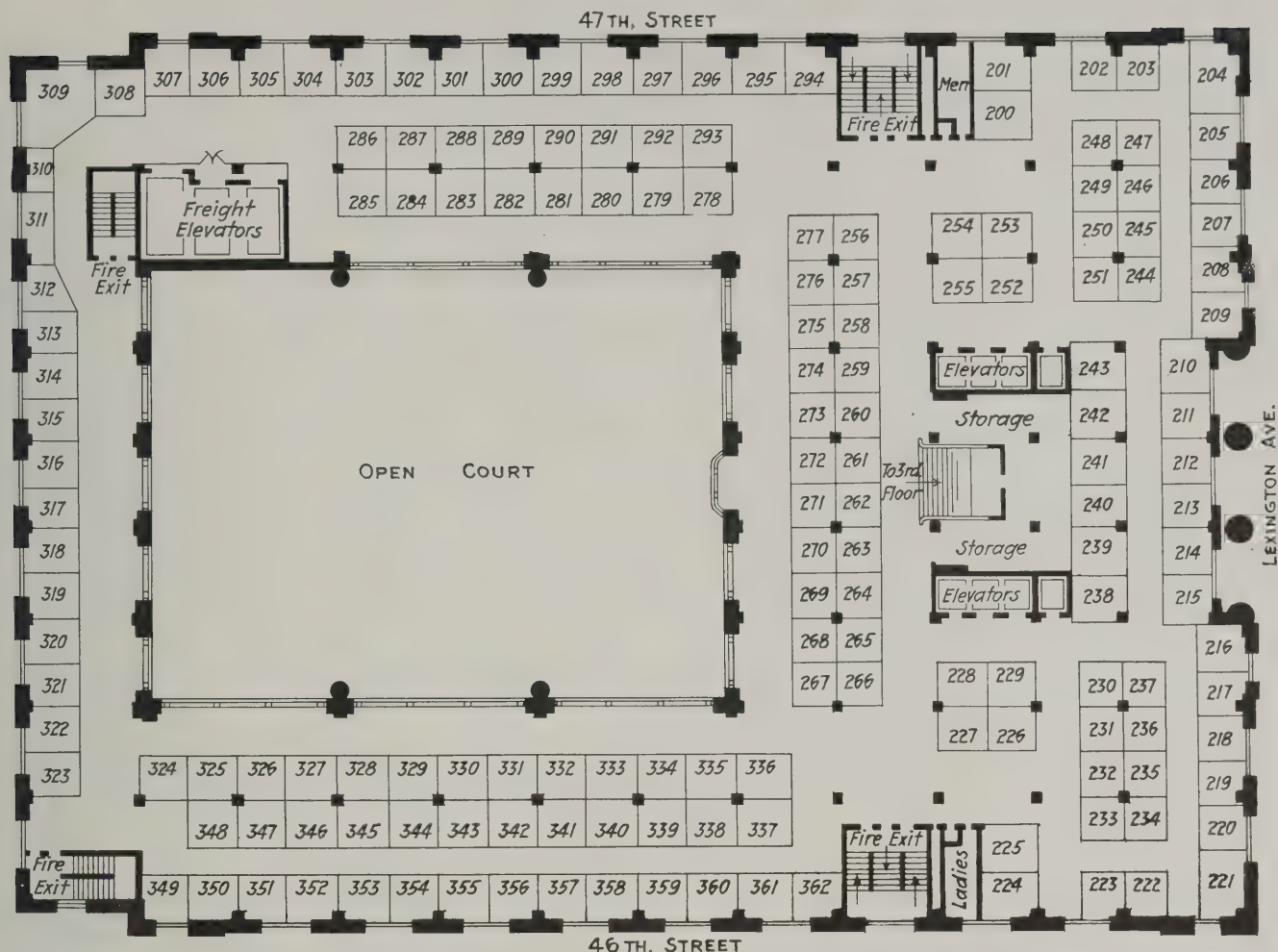
General Electric Company, Schenectady, N. Y.—Ten kilowatt steam engine driven generating set with a portion of the steam chest and cylinder removed, and glass doors for the column to show the operation of the reciprocating parts; also a switchboard for this unit which will be in operation; two 18-inch searchlights, one hand control, the other electrically controlled, will be in operation; one COM type direct-current motor for use in connection with deck auxiliaries direct-connected to a shoe type solenoid brake for use with deck machinery, the motor to be operated and controlled through a C-410-A type master controller with suitable resistance; in addition, a separate motor bearing head will be sectionalized to show the method of lubricating the journal, and the manner in which entering water is prevented from passing into the oil wells by suitably designed passages and

chambers; automatic motor driven air compressor as used for cleaning electrical and other apparatus, for an emergency compressor on motorships, and for pneumatic tools used in drilling holes, beading and calking seams, scaling plates, etc.; RCM direct-current motor in operation; 32-volt 500-watt turbine-generator set designed especially to supply electric energy for the lighting of a headlight or searchlight on tugs or other vessels; the principles of Diesel engine electric drive as applied to the propulsion of various types of vessels will be shown in animated form in a manner that the non-technical visitor will readily understand the principles involved; 174-A drum type watertight controller; various charts giving interesting data on 322 ships equipped with marine geared turbines and 39 vessels having General Electric Company electric propulsion and control machinery. Representatives: L. W. Shugg and engineers of the Marine Department. Booths 3, 4, 5, 6.

B. F. Goodrich Rubber Company, Akron, Ohio.—Cutless bearings; sealing rings; mechanical rubber goods for the marine industry. Representatives: C. F. Sherwood, L. Q. Moffitt, W. A. Whitenack. Half of Booth 84.

Griscom-Russell Company, 90 West Street, New York.—Representative examples of line of marine auxiliaries; Reilly submerged type evaporator, feed water heater assembled with complete fittings in both single and two-pass types, feed water filter and grease extractor of the pressure type and fuel oil heaters both of the Reilly coil design and the more recent straight tube type; sectional model of multiwhirl oil cooler which has been used so extensively for the cooling of lubricating oil for geared turbines, turbo electric and Diesel engine installations; marine fittings such as automatic float controls, special valves, separators, etc.; new G-R low pressure expansion joint. Representatives: R. Colston, B. P. Collings. Booth 60.

Hill Rotors, Inc., 42 Broadway, New York.—Air compressors, liquid pumps, vacuum pumps, combined liquid and vacuum pumps. Representatives: Myron F. Hill, Francis A. Hill, Walter G. Thomson, T. H. Wolf. Booth 252.



Mezzanine Floor of Marine Exposition, Grand Central Palace, Lexington Avenue and 46th Street, New York City

Hooven-Owens-Rentschler Company, Hamilton, Ohio.—Views of the plant and Hamilton engines and parts of Hamilton equipment. Representatives: Henrik Greger, H. A. Smith, F. L. Hummer. Booth 17.

Ingersoll-Rand Company, 11 Broadway, New York.—Photographs of semi-Diesel engine installations on board ship as well as of marine oil engines, machinery and other equipment for shipyard uses. Literature will also be distributed descriptive of various products of the company. Representatives: L. D. Albin, F. W. O'Neil, D. C. Keefe, R. W. Douglass, R. R. Womack, L. V. Armstrong, G. W. Morrison, F. K. Armstrong, J. W. Morton, P. T. Brostrom, J. V. Mossman, H. R. Fee, H. G. Erb. Booth 47.

Journal of Commerce and Commercial Bulletin, 32 Broadway, New York.—Representative: H. V. S. Negus. Booth 50.

Walter Kidde & Company, 90 West Street, New York.—Rich system for smoke detection; Lux system for fire extinguishing; electro-vapour radiator for electric heating. Representatives: W. H. Freygang, A. M. Doxsey, G. Crosby Hiss. Booth 49.

Knudsen Motor Corporation, 30 Church Street, New York.—120 horsepower 2 cycle engine, full Diesel type; 50 horsepower 2 cycle engine, full Diesel type. Representatives: M. Knudsen, J. B. Tait, C. Knutson, J. R. Pitbladdo, Capt. P. P. Songdahl, F. G. Schneeberg, Jr., J. W. Barnett, A. Doll, G. Allardyce. Booth 81.

Lunkenheimer Company, Cincinnati, Ohio.—Complete and interesting display of both high and low pressure valves, boiler mountings, whistles and similar high grade engineering appliances; steel, bronze and iron globe angle, check and gate valves; water columns, water gages, gage cocks, blow-off valves, safety non-return stop valves, etc. Representative: W. Reynolds. Booth 95.

McIntosh & Seymour Corporation, Auburn, N. Y.—Photographic enlargement of largest engine, type 6-C-56. Representative: B. P. Flint. Booth 59.

Marine Decking & Supply Company, 116 North Delaware

avenue, Philadelphia, Pa.—Madesco tackle blocks; American Lit-O-Sil-O decking; American Lit-O-Sil-O flooring; several paintings showing American Lit-O-Sil-O. Representatives: G. W. Selby, W. L. Peebles, E. P. Jewell. Booth 110.

Marine Engineering and Shipping Age, 30 Church Street, New York.—MARINE ENGINEERING AND SHIPPING AGE, *The Boiler Maker*, "Shipbuilding Cyclopaedia," "Practical Marine Engineering," "Laying Out for Boiler Makers" and marine books. Representatives: Colonel E. A. Simmons, Henry Lee, C. R. Mills, R. V. Wright, George Slate, James Swan, H. H. Brown, L. S. Blodgett, W. Z. Gardner, H. B. Bolander, J. A. Miller, B. L. Dombrowski, R. F. Duysters, N. C. B. Fowles, J. E. Anderson, H. E. McCandless, R. W. Zinn, George Laxar, E. H. Allen, G. W. Stutt. Booths 94 and 106.

The Marine News, 26 Water Street, New York.—Booth 83.

The Marine Review, Cleveland, O.—Booth 30.

Morse Dry Dock & Repair Company, foot of 56th Street, Brooklyn, N. Y.—Photographs of plant and pictures covering not only the general run of straight ship repair work, but including important Diesel repair and oil burning installations as well. A unique working demonstration of the Morse fuel oil burning system will be in operation as well as a working model of certain new devices. Representatives: Frank Breyfogle, D. J. Irish, L. R. Ford, D. V. Stratton. Booth 72.

National Malleable Castings Company, Cleveland, O.—Complete line of anchor chain together with anchor and connecting shackles as well as swivels. Representatives: Benjamin Nields, Jr., W. C. Lewis, E. Sihler, E. E. Eyman, R. E. Valentine. Booth 57.

National Meter Company, 299 Broadway, New York.—Full line of oil and gasoline meters for marine purposes with special reference to meters for oil-burning equipment. Representatives: G. D. MacVeagh, J. J. Pirrung. Booth 14.

Natural Carbonic Gas Company, Newark, N. J.—Carbonic gas in steel cylinders. Representatives: P. E. Fay, T. P. Arnold. Booth 267.

New London Ship & Engine Company, Groton, Conn.—One 180-horsepower engine. Booth 75.

Newport News Shipbuilding & Dry Dock Company, Newport News, Va.—Representatives: L. D. Pickering, F. L. Hoffman, R. H. Lee. Booth 32.

Northern Fire Apparatus Company, Minneapolis, Minn.—Electric driven fuel oil pump (high pressure), electric driven fuel oil pump (high vacuum) in operation; boiler feed pump; fire and bilge pump. Representative: J. A. Hense. Booth 54.

Pantasote Company, 11 Broadway, New York.—Vehisote panel and tile boards for bulkheads, ceilings, wainscoting, partitions, etc.; Pantasote upholstery and curtain materials; Russaloid upholstery. Representative: W. A. Lake. Booth 28.

Peabody Engineering Corporation, 110 East 42nd Street, New York.—Double-ported hinged type register fitted with Peabody-Fisher wide range mechanical burners; the double-ported type of register was especially designed for high capacity on low drafts. Representatives: J. P. Leask, E. B. Sadtler, S. T. Warner, R. C. Vroom. Booth 13.

Port of Charleston, Charleston, S. C.—Booth 255.

Power Specialty Company, 111 Broadway, New York.—Complete detail parts of Foster marine superheaters and a section of the new Foster marine economizer. Representatives: H. W. Parsons, R. L. Lovell, J. J. Nelis. Booth 101.

Pneumercator Company, 40 Flatbush Avenue Extension, Brooklyn, N. Y.—Pneumercator tank gages, ship's draft gages and distant boiler gage glass. Representatives: W. Thomas, Calvin J. Wicks. Booth 36.

Radio Corporation of America, New York.—Booth 48.

The Roto Company, Hartford, Conn.—Roto tube cleaners for boilers, both watertube and Scotch marine; condensers, both surface and double-pipe; evaporators, heaters, etc., together with Paragon header scrapers and cap cleaning machines. Representatives: Messrs. Doherty, Van Nortwick and Kelley. Booth 266.

Row & Davis Engineers, Inc., 90 West Street, New York.—RanD system for reliquidizing fuel oil without the aid of steam coils in ships' inner-bottom tanks; improved Paracoil fuel oil heater; standard Paracoil feed water heater; Paracoil evaporator, fresh water still; R & D steam trap, grease extractor. Representatives: Messrs. Row, Davis and Thompson; also Messrs. Smith and Young. Booth 63.

Rubber-All-Products Company, 821 Broadway, New York.—Rubber-All waterproof suit; the exhibit will include, "The Acid Test," which will show by actual demonstration the indestructible waterproof material used in the manufacture of Rubber-All suits. Representative: H. S. Dube. Booth 69.

Scovill Manufacturing Company, Waterbury, Conn.—Cup drawn Admiralty condenser tubing. Samples of corroded tubing, defective tubing and the best grade of material shown under the microscope. Samples of brass mill products, such as sheet, rod, wire and seamless tubing as well as manufactured articles made from raw materials. Representatives: E. H. Callanan, P. Davidson, C. A. Gleason, C. B. Kerr, Jr., G. T. Power, L. R. Root, M. N. Rose, C. W. Snowman, A. M. Southall, M. L. Sperry, Jr., W. E. Twining, L. L. Williams. Booth 58.

Sperry Gyroscope Company, Manhattan Bridge Plaza, Brooklyn, N. Y.—Navigational instruments; two complete MK VI Gyro compass equipments—a Gyro-pilot, the automatic helmsman, 5 of which during the last two years have efficiently steered five ships over 150,000 miles; improved helm angle indicator system, improved ship's log system; improved revolution indicator system. Sperry 18-inch high intensity Duralumin marine searchlight; 36-inch high intensity searchlight similar to the one installed on the *Leviathan* and as installed on the 5 Night Air Mail Fields. Gyroship's stabilizer model in operation. Representatives: R. B. Lea, Messrs. Whitaker, Jobson, Sparling, Patterson, Bates and Hodgman. Booths, 20, 21, 22, 23.

Shipley Construction and Supply Company, 42nd Street and 2nd Avenue, Brooklyn, N. Y.—Refrigerating machinery and parts. Representatives: R. G. Land, E. Phillips. Booth 35.

The Sterling-Cooper Corporation, 318 West 39th Street, New York.—Technical and commercial marine books; Sterling's Marine Catalog. Representatives: F. W. Sterling, T. G. Newbery. Booth 67-A.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.—Stationary type vacuum cleaner; portable vacuum cleaner; individual oil burner turbine blower; vertical single engine; gasoline engine-driven generating set; turbine for auxiliary drive; various size ventilation fans both motor and turbine driven; 3,000-foot ventilation heater. Representatives: E. B. Williams, E. L. Moran, W. A. Finnegan. Booth 107.

Submarine Signal Company, 160 State Street, Boston 9, Mass.—Submarine bell; submarine oscillator; standard submarine signal receiving apparatus; new portable submarine

direction finder; new submarine sounder; stereomograph pictures showing activities of the company in making navigation safe. Representatives: H. J. W. Fay, E. P. Howe, E. F. Irwin. Booth 256.

Sun Shipbuilding Company, Chester, Pa.—Large size model oil tanker *Atlantic Sun*; photographs of ships built and various views of shipyard and shops; photographs of Diesel engines built at yard. Representative: T. T. Borden. Booth 78.

The Superheater Company, 17 East 42nd Street, New York.—Model of the Elesco fretube superheater as applied to the Scotch marine type boiler; model of the Elesco superheater as applied to marine watertube boiler and boilers used on Mississippi river boats; steam pyrometers for measuring temperatures; engineering data and literature. Representatives: H. B. Oatley, G. E. Ryder, C. A. Brandt, G. E. Kershaw, W. McLintock, G. L. Moore, J. A. Barnes. Booth 73.

The Texas Company, 17 Battery Place, New York.—Miniature oil derrick and full line of marine lubricants. Representatives: F. J. Shipman, H. W. Schilling, E. A. Lobb, A. St. James, G. C. Bartlum, J. L. Ward. Booth 35.

P. S. Thorsen & Company, Inc., 81 Coffey Street, Brooklyn, N. Y.—Complete line of insulation, including practical demonstrations of the saving to be made by proper insulation. Representatives: P. S. Thorsen, M. L. Bullard, R. S. Warner, W. Davies, T. Drydale, V. Menig. Booth 98.

W. & J. Tiebout Company, 118 Chambers Street, New York.—Standard line of ship joiner hardware with various new patterns and designs that have been brought out recently. Representatives: J. Tiebout, Jr., G. V. Carlin, Chas. H. Schult, F. J. Morrissey, J. D. Gillespie. Booth 27.

Todd Shipyards Corporation, 25 Broadway, New York.—Todd twin pole arc welder; Todd oil burning galley range; Todd fuel oil burners for marine and land installation. Mr. Arnold L. Wernert, instructor for the "TODD" Oil Burner School, will be present during the entire period of the show and will give an outline of the course of instruction in oil burning. Representatives: Robert G. Payne, A. J. Holifield, J. A. H. Hood. Booths 92 and 108.

United States Department of Commerce, Washington, D. C.—Booths 214 to 225, inclusive, and 230 to 240, inclusive.

United States Department of Public Health, Division of Marine Hospitals, Washington, D. C.—Booths 316 to 323, inclusive.

United States Navy, Washington, D. C.—Booths 201 to 213, inclusive, and 241 to 251, inclusive.

Valentine & Company, 456 Fourth Avenue, New York.—Table top testing table; running water machine; Valspar varnish stains; demonstration of Valspar's waterproof qualities; panels of clear Valspar, Valspar varnish stains and Valspar enamels; color chart made up of glasses showing different shades of Valspar enamel; original painting by Lieut.-Com. Henry Reuterdaahl, U. S. N. R., used in advertising the fact that Valspar was used on the *Leviathan*. Representatives: H. Pulsifer, D. Walker, deCamp Freeman. Booth 43.

Welin Davit and Boat Corporation, 305 Vernon avenue, Long Island City, N. Y.—Models of various types of Welin quadrant davits with lifeboats attached; samples of Permacote red lead. Representatives: H. F. Sailor, Walter J. Krolman, O. J. Slaght, Chas. White, R. E. Keppler. Booth 254.

Westinghouse Electric & Manufacturing Company, 165 Broadway, New York.—100 kilowatt turbine driven auxiliary power generating set; 1½ kilowatt turbine generator lighting unit; sectional bake oven; marine oscillating fan; inter-cooler type air ejector; Diesel engine generator model; pilot house control desk; marine controllers; marine motors; electric water heaters; engine circulating water pump. Representatives: G. H. Froebel, W. B. Barrett, C. C. MacMillan, R. E. Aldridge, W. E. Thau, H. C. Coleman, E. D. King, H. M. Southgate, B. H. Hamilton, C. F. Duffield, J. J. Brown, W. F. James, E. F. Clark, L. D. Howell, H. L. McCarter, P. A. Sensenig. Booths 82 and 83.

C. H. Wheeler Manufacturing Company, Lehigh and Sedgley Avenues, Philadelphia, Pa.—New type of Radojet air pump, designed for closed feed water systems; two small surface condensers combined in one unit arranged one between the first and second stage and one after the second stage; marine type condensate pumps; dynamometer; Radojet augments. Representatives: G. L. Kothny, C. Lang, J. J. Mullan, J. Dobson. Booth 7.

Worthington Pump & Machinery Corporation, 115 Broadway, New York.—Pumps; meters; 120 horsepower Diesel engine. Representatives: L. Katsenstein, W. A. Cather, I. W. Jackman, C. B. Humphrey, J. J. Morch. Booth 96.

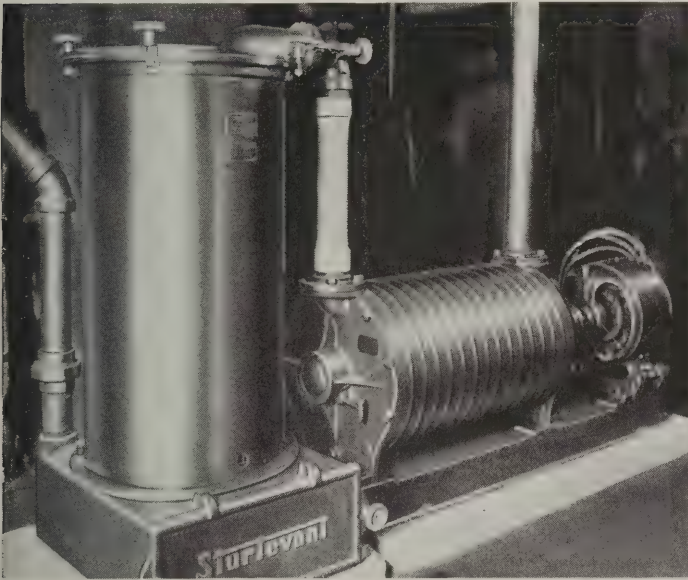
New and Interesting—

Marine Devices Described Below Will be Shown at
the Marine Exposition This Year for the First Time

Vacuum Cleaner and Turbo Blower Developed by Sturtevant

TWO new pieces of equipment will be featured at the B. F. Sturtevant Company, Hyde Park, Boston, Mass., exhibit—the Type-E vacuum cleaner and the A-13 individual oil burner turbine blower. The Type-E cleaner is known as the horizontal type and is of the same general design as the larger size cleaners made by the company.

The vertical chamber is a dust collector. The fans which create the suction are in the horizontal section at the center. The air first passes through the collector and is thoroughly filtered before being exhausted. The dirt, therefore, cannot reach the fans or bearings and clogging or unbalancing of



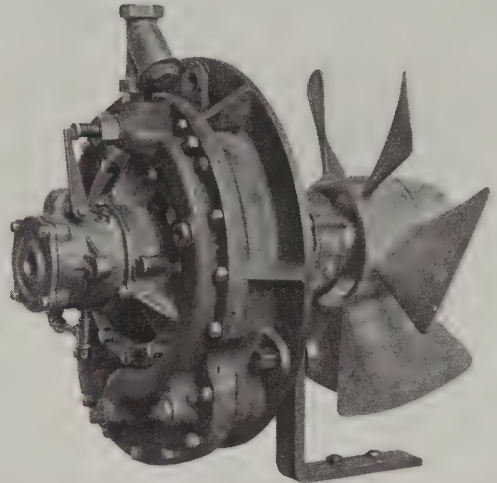
Horizontal Vacuum Cleaner Known as Type-E

the fans or injury to them is thus avoided. The bearings of the fan are automatically lubricated and arranged so that no grease can reach the dust bag. The dust bag is easily removable for cleaning or renewal.

This type of cleaner is made in seven sizes besides various other types of vertical and portable machines.

TURBO BLOWER

The A-13 turbo blower unit consists of a multi-velocity impulse steam turbine and a fan of the cast aluminum propeller type. The turbine bucket wheel is a solid forging with buckets milled into the rim. Because of the hollow shaft, the ball bearings are exceptionally large thereby assuring long life. Each gland is fitted with carbon packing which requires no lubrication or adjustment during its life. Convenient arrangements are made on the turbine casings for attachment of the oil burning apparatus.



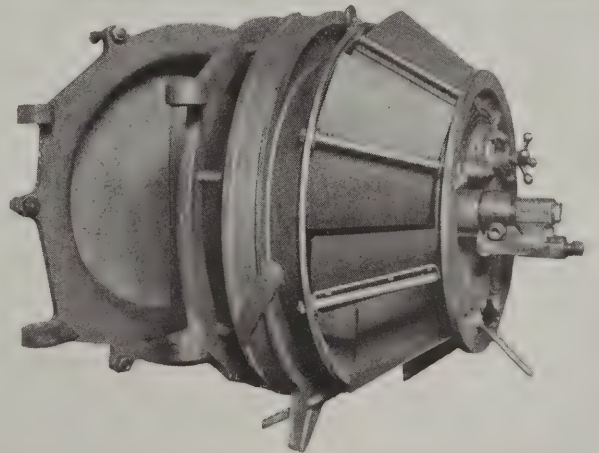
Size A-13 Blower Unit

The unit is fitted with a specially designed and patented governor of the speed limiting type which does not allow the turbine to exceed its safe operating speed at any pressure.

Double Ported Register Fitted with Wide Range Burner

AMONG the special equipment which the Peabody Engineering Corporation, New York city, will exhibit this year is a double-ported hinged type register fitted with Peabody-Fisher wide-range mechanical burners.

This register was especially designed to meet the needs of ships operating under natural draft with fairly low stacks.



Wide Range Mechanical Burner Assembled with Double Ported Horizontal Type Register

This register is an adaptation of the standard Peabody air register and has an enlarged furnace opening and an auxiliary air port in place of the standard back plate.

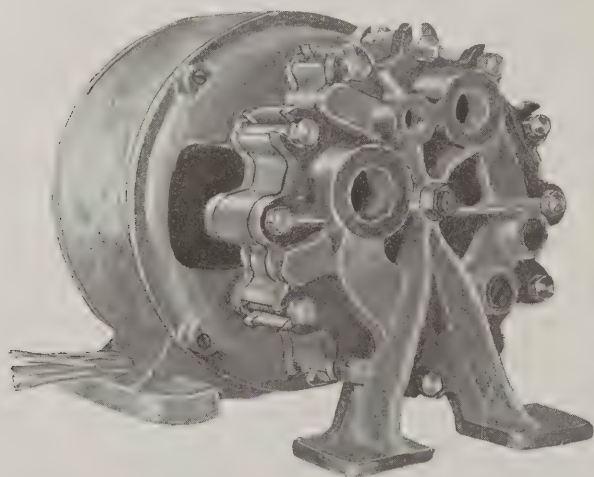
The amount of opening of the auxiliary port is controlled by means of a ring which is supported on three rollers. This ring opens and closes with a helical movement so that all chance of the ring sticking or becoming cocked is eliminated. The rotative movement of the ring is controlled by a crank actuated by a handle on the register front. The design shown in the accompanying illustration is for natural draft operation and is hinged so as to permit ready access to the furnace. This type of register has been in service on ship-board for some time and has given exceptional results.

This same type register is used in conjunction with the Howden heated air system and supplants the combination coal and oil front. The Hudson River Day Line steamer *DeWitt Clinton* is fitted with a complete installation of these registers, which have been used with great success during the season just passed.

For use with forced draft double front installation, the design is modified slightly, the hinges being fastened to the front plate, permitting the register to swing out of the double front. This design will be installed on the Day Line steamer *Alexander Hamilton* now being built.

New Principle Discovered in Pump and Compressor Rotor Design

WHAT is claimed to be a hitherto unknown principle of rotary motion as applied to pumps and compressors will be the main feature of the exhibit of Hill Rotors, Inc., New York city. It is claimed that the new Hill Rotors mechanical motion can handle pressures from 20 to 400 pounds at any speed up to 2,000 revolutions per minute with a satisfactory degree of efficiency. These rotors consist of



Hill Rotors Motor Compressor Unit

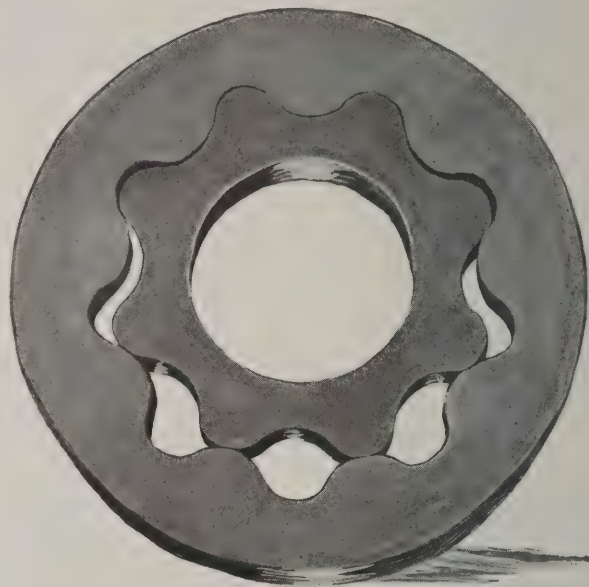
one inside the other; one has nine lobes or teeth and the other eight. The curves of these rotor lobes involve entirely new geometrical relations and open up an entirely unexplored mathematical field. They are such that they have a continuous pressure holding engagement between the high pressure port and the low pressure port.

The outer rotor drives the inner rotor and air or liquid in one of the spaces never slips back between the lobes into the next larger space behind it. Each space does its own compression and discharges independently of its neighbor. These rotors rotate on fixed centers, the inner rotor being eccentric to the outer so that they open a series of spaces on

one side to receive the pumped fluid and close them to discharge it on the other side.

Due to the pressure holding engagement between the rotors and the positive mechanical action, pressure and volumetric efficiency are practically independent of the speed of rotation. The only factor to vary with the speed is the capacity.

On test a small paint spraying air compressor had a volumetric efficiency of over 90 percent at 50 pounds pressure. A small liquid pump had between 95 percent and 100 percent



Form of Rotors Developed for Pump and Compressor Service

volumetric efficiency on pressures up to 100 pounds. These pumps have attained pressures up to 370 pounds on air and 400 pounds on liquids. In both cases when attaining these pressures the power was shut off to save the piping.

Due to the fact that there is practically no clearance between the rotors, Hill rotors, it is claimed, will pull as perfect a vacuum as can be measured on a mercury column.

Where power efficiency is not of prime importance one Hill rotor pump can be made to handle liquids, air compression, or a vacuum.

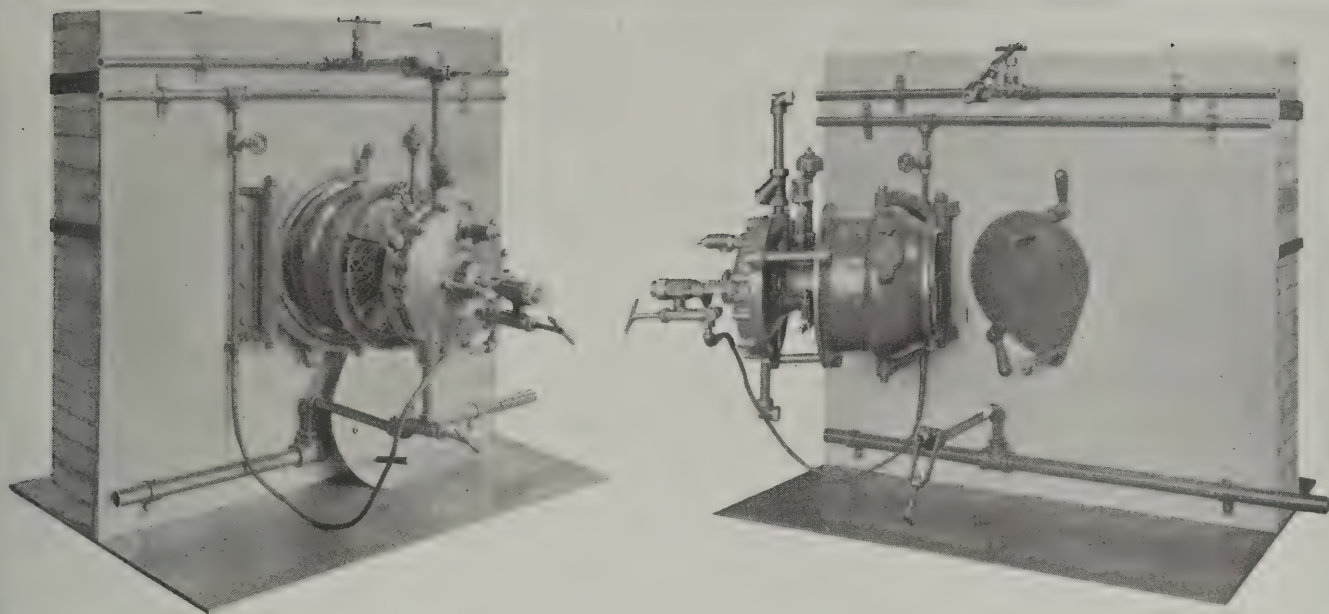
In electric units there are only three moving parts, the inner rotor, the outer rotor, and the driving shaft which is direct connected to the motor.

Salinity Concentration Indicator—Oil Burner with Self-Contained Forced Draft

TWO new developments in apparatus made by the Babcock & Wilcox Company, New York, which will be shown at the Exposition this year, are a concentration salinity indicator and a mechanical atomizing oil burner known as the Mayflower design with a self-contained forced draft system.

The salinity indicator shows automatically and instantaneously an increase in the density of the water by showing various colored lights, a white light for 0.5 grain, a green light for 0.5 to 5 grains and a red light for a density over 5 grains. This is an especially valuable feature in connection with the evaporator room, as an instantaneous warning is given when the quality of the distillate changes, thus obviating the possibility of running poor water.

The signal light controller also keeps an accurate check on



Mayflower Design Oil Burner Which Eliminates All Ducts for Forced Draft Service

the condenser, which is an important feature for merchant vessels. A continuous indication of the quality of the condensate is shown at all times, the warning lights showing as in the case of the evaporator, but with a slightly different range. The white light shows a density up to 0.3 grain, the green light shows from 0.3 up to 1 grain, and the red light shows above 1 grain.

MAYFLOWER DESIGN BURNER

The Mayflower design burner consists of the main casting with a bladed cone, to which a hollow shaft turbo blower is attached. The atomizer fits through the blower shaft and may be moved in and out by the adjustment of coupling studs. A quick detachable yoke and coupling, similar to that used on other Babcock & Wilcox types of burners is also fitted to the atomizer. An impeller blade is fastened to the bladed cone by means of lugs. Access may be gained to the furnace by swinging aside the burner which is hinged. This also provides for the insertion of a fire tile plug which is put in place when the burner is not in use. Steam connections to the turbine are detachable and somewhat similar to the quick detachable yoke and coupling used on the oil burner connection.

The special advantages claimed for the burner are that on forced draft work it eliminates all ducts as well as the large blowers supplying air to the ducts; further, any number of burners can be run independently without having air leakage through dead burners, as is sometimes found when double front construction is used. As the air for combustion can be regulated very closely to the required amount, owing to the multiplicity of speeds available with the turbo blower, higher efficiency can be obtained.

Radojet Air Pump for Closed Feed Water Systems

THE latest development of the C. H. Wheeler Manufacturing Company of Philadelphia is a new type Radojet marine air pump designed for closed feed water systems.

Two small surface condensers combined in one unit are arranged, one between the first and second stage, and one after the second stage. The first one is called the inter-

condenser and the second the after-condenser. The first condenses the steam discharged from the first stage, while the second one condenses that from the second stage. The condensate from the main condenser is used as circulating water for both condensers. With this arrangement the condensate does not come in contact with the air discharged by



Radojet Air Pump for Marine Service

the Radojet. All the heat contained in the steam is returned to the boilers which results in a thermal efficiency of about 98 percent.

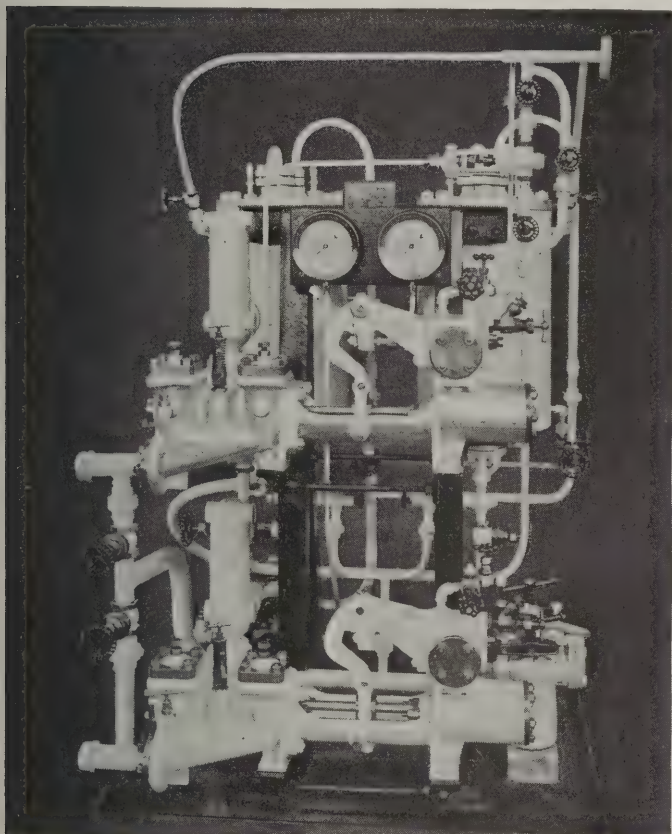
In each of the two condensers provision is made for a cold water pass, which is supplied from the main circulating pump. This water supply is used only when starting up the main turbine unit, when there is not sufficient condensate

impinging against the bearing wall, is thrust into the groove when the flow of water carries it away. Again, the resiliency of the tough rubber construction of the cutless bearing nullifies in large part vibration of the screw.

Self-Contained Oil Pumping Outfit

THE combined pump and heater set shown in the accompanying illustration is a development to meet the needs for a self-contained unit for fuel oil burning. It forms part of the Bethlehem (Dahl) mechanical oil burning system which is manufactured at the Moore Plant, Elizabeth, N. J., of the Bethlehem Shipbuilding Corporation, Limited.

This self-contained unit consists of the fuel oil pressure



Bethlehem Oil Pumping Unit

pumps, heaters, suction and discharge strainers, with the necessary connecting piping, gages, etc., all mounted on a welded steel base. These units are manufactured in all sizes to meet any requirements in oil burning installations.

This set is being shown for the first time to the marine industry at the Marine Exposition.

Unusual Electric Radiator

WALTER KIDDE AND COMPANY, New York City, engineers handling the Rich system for detecting and extinguishing fires, will show a novel electric radiator at the Marine Exposition this year. Each electro-vapour radiator is in effect an individual steam heating plant consisting of an ordinary cast iron radiator with a chamber permanently attached containing a small quantity of liquid which vaporized by a contained electric heating element. The liquid will last indefinitely, but the quantity should be inspected each season.

The radiator operates under a vacuum, affording relatively

quick heating. The electro-vapour radiator gives, by the turn of a switch, the same ideal heat electrically as the usual steam or hot water radiator.

Electro-vapour radiators are furnished in any size and may be fitted to operate at different heats and voltages. The



Electro Vapor Wall Radiator of the Stateroom Type

heating surface required is calculated in accordance with the usual practice for steam radiation. An approximation is 7 square feet of heating surface for each 20 degree increase in temperature in a room 10 by 12 by 8 feet having one window.

Submarine Direction Finding and Submarine Sounding Apparatus for Small Boats

THE portable submarine direction finder and submarine sounder are devices which the Submarine Signal Corporation, Boston, Mass., has developed after years of experimentation. These devices are designed to afford a much needed protection to those adrift in small boats and will be shown for the first time at the Marine Exposition. The great value of a direction finding device which makes it possible to inform the user of the direction from which sounds are coming and thus enables him to steer his boat or vessel toward the source of sound has been generally recognized. This company has consequently designed portable sending and receiving apparatus wherewith this desired result can be attained.

The submarine direction finder is virtually a large inverted Y. The finder is provided with a collar, surrounding the vertical portion, to which is attached a rod which is used to support it from the side of the vessel. This rod is pinned to the collar, thus forming a hinge which allows the device to move freely backward and forward. A plate is also provided which is designed to be bolted permanently to the rail of the vessel from which the submarine direction finder is to be used. This arrangement is equivalent to gimbals and thus, while permitting the direction finder to be rotated on its vertical axis, at the same time allows the force of gravity to hold the tube always in a vertical position.

When the submarine direction finder is to be used the rod is inserted in the hole in the plate and a pin inserted to keep the rod and finder in position. This arrangement permits the submarine direction finder to be readily mounted when observations are to be made and removed when the observations have been concluded.

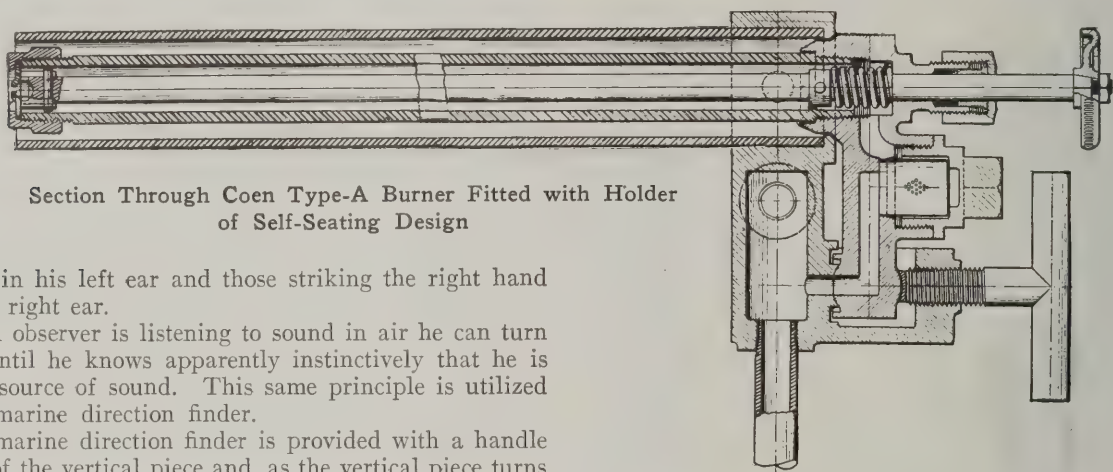
The finder has two rubber bulbs, one on the end of each arm. Two small tubes, one from each bulb, run from the bulbs to the end of the vertical pipe and project as shown in Fig. 1. These bulbs are the underwater ears. Two flexible rubber tubes, known as stethoscope binaurals connect the ends of the small tubes of the direction finder with the ears of the listener. In this way the observer can hear the submarine sounds; he will hear the sound waves striking the left

and can be heard at very considerable distances. Moreover they are of a character that enables the submarine direction finder to be used with the greatest ease and accuracy.

Mechanical Oil Burner with Self-Seating Holder

THIS year the Coen Company, oil burning specialists of San Francisco, will show the new type-A mechanical oil burner with self-seating holder as a feature of their exhibit.

The Coen burner is a flexible mechanical oil burner. By



Section Through Coen Type-A Burner Fitted with Holder of Self-Seating Design

hand bulb in his left ear and those striking the right hand bulb in his right ear.

When an observer is listening to sound in air he can turn his head until he knows apparently instinctively that he is facing the source of sound. This same principle is utilized in the submarine direction finder.

The submarine direction finder is provided with a handle at the top of the vertical piece and, as the vertical piece turns freely in its support, the bulbs can be rotated with the vertical

flexible is meant a burner that can produce a full fire or a small fire at the will of the fireman and change from one fire to the other instantly without extinguishing the flame, altering the oil pressure, or impairing the quality of the flame.

This control is made possible by the adjustable burner tip. The complete burner consists of a special inner valve, a short piece of tubing, a tip, a cap to hold the tip in place and a steel rod running through the burner to provide means for regulating the discharge from the tip. The Coen burner will operate with fuel oil of any gravity.

The regulating rod in the burner has a rotative movement of $\frac{1}{4}$ inch only. When turned to the extreme left the burner is wide open delivering the maximum fire. By turning the rod to the right the fire is gradually diminished until the stop pin comes in contact with the shoulder of the burner tip at which point the minimum or standby fire is produced. It is not possible to turn the rod far enough to extinguish the fire for the burner valve is for regulating only and not a shut-off valve. The sectional view shown is a burner with the type-A self-seating burner socket.

Great Congress to Feature Marine Week

(Continued from page 684)

ship of the American merchant marine, the *Leviathan*, the *Minnewaska* of the Atlantic Transport Lines, the *Seekonk*, one of the latest type American motorships reconditioned by the William Cramp & Sons Ship and Engine Building Company, the *Cleveland* of the United American Lines and the *Westphalia* of the Hamburg-American Line.

BANQUETS TO BE HELD

The American Marine Congress will hold a banquet under the auspices of the American Marine Association on Thursday evening, November 8 at 7:30 P. M. in the grand ball room of the Waldorf-Astoria hotel. Secretary of Com-



Fig. 1.—Portable Submarine Direction Finder Fig. 2.—Submarine Sounder for Lifeboats

piece as an axis until the sound seems to reach the observer from a point directly in front of him. When this is the case the handle is pointing directly toward the source of sound.

DETAILS OF SUBMARINE SOUNDER

The submarine sounder is shown in Fig. 2. It consists of a metal cup to one side of which is attached a rod. The submarine sounder when in service is hung from the rail of the boat in such a way that the open side of the cup is facing downward and the rod extends upward and somewhat above the rail of the boat. The user is provided with a hammer and the submarine signals are produced by hitting the end of the rod with the hammer.

The signals created in this way are sharp and clear

merce Herbert Hoover; O. E. Bradfute, president of the American Farm Bureau Federation; Winthrop L. Marvin, vice-president of the American Steamship Owners' Association; Admiral Plunkett, United States Navy, and Captain Irving O'Hay, famous adventurer upon whose life was based Richard Harding Davis' "Soldiers of Fortune," will be among the principal speakers of the evening. Secretary of the Navy Denby has directed the 80-piece band of the U. S. Battleship *Colorado* to be in attendance to furnish a concert during the evening.

The annual banquet of the Society of Naval Architects and Marine Engineers will also be held in the grand ball room of the Waldorf-Astoria on Friday evening, November 9.

The New Shipping Board Plan

By Harold F. Lane

WASHINGTON, D. C.

THE Shipping Board has worked out a plan for the operation of the Government-owned ships, as a substitute for the previous managing operator plan, which seems to amount practically to direct Government operation, at least for the present, while avoiding the legal obstacles which Attorney General Daugherty found to stand in the way of the board's plan for operation through subsidiary corporations. Under the plan as announced by the board on October 16 to be put into effect in the immediate future in the North Atlantic, United Kingdom and Ireland service by the consolidation of five routes into one line, the physical operation of the ships will be under the direct supervision of the board, while the soliciting and booking of freight, the handling of the freight at the terminals and its loading on board ship will be in the hands of loading agents, under contract with the board and paid for on a strictly commission basis. In other words, the plan is one of subsidiary organizations but not subsidiary corporations, as the Attorney General held that to turn the ships over to separate corporations would amount to a sale of the vessels not in accordance with the provisions of the law.

Under the existing plan the managing operators operate the ships for the Government and receive a commission on the business done as well as a husbanding fee, while the Government receives the revenues and pays the expenses. It is the announced intention of the board to utilize as far as possible the experience and services of the present operators as loading agents, but according to the board's announcement, "the monies appropriated by Congress will be expended under the direction of the board and under the immediate supervision of Government officials." Complete details of the plan, which is expected to be applied to other services, have not yet been made public, nor has the exact nature of the contract to be entered into with the loading agents been disclosed, although it is stated that the contracts will provide for such modification as experience shows to be desirable and can be terminated at the board's discretion upon reasonable notice. At the White House it was stated that the President had not approved any specific plan but expected to confer further with Chairman Farley before anything was done of a permanent nature.

According to the statement issued by Chairman Farley announcing the plan, the board considered that it "had worked out a solution of the problem of operating its ships so as to utilize as far as practicable the recommendations received from those familiar with the present day shipping problems." He added that "it is expected by this arrangement that the hearty co-operation and best endeavors of experienced private shipping organizations will be obtained and utilized to the fullest extent in conducting the Government's shipping operations."

The board hopes that considerable savings will result from the consolidation of routes, and this action means, Mr. Farley said, that "the American Government intends to remain squarely behind the maintenance of these American flag routes. The changes determined upon are intended to give better, more efficient and more elastic service between this country's North Atlantic ports and those on the east and west coasts of the United Kingdom."

NEW ORGANIZATION FOR U. S. LINES

The board has also announced a reorganization of the management of the United States Lines which, it was stated, "makes of the United States Lines practically a subsidiary corporation of the Emergency Fleet Corporation."

The supervision of the United States Lines has been placed under a sub-committee of the Shipping Board consisting of Commissioner O'Connor, as chairman, and Commissioners Plummer and Benson.

The relations of this sub-committee to the affairs of the United States Lines will be essentially those of a committee of a board of directors to whom the board has delegated immediate supervision. W. J. Love is to be managing director. He has resigned as general manager of the Fleet Corporation. T. H. Rossbottom will be appointed general manager in charge of operations.

"The new arrangement makes of the United States Lines practically a subsidiary corporation of the Emergency Fleet Corporation," Mr. Farley said. "The operating department of the United States Lines will have immediate supervision of the physical operation, maintenance and care of the ships, victualing and purchasing departments, and all other activities pertaining to the operation of the vessels of the line. There will be a freight traffic manager and a passenger traffic manager also. The treasurer of the Fleet Corporation is to be treasurer of the United States Lines. The general comptroller of the Fleet Corporation will have charge of the accounting. This change in the operation of the United States Lines is to be immediately effective."

American Legion Pledges Aid for Upbuilding of Merchant Marine

AT the fifth annual convention of the American Legion held last month in San Francisco the following resolution, proposed by Edward Elwell Spafford, commander of the Department of New York, was adopted:

"If all navies were sunk by treaty, merchant marines would then be the principal source of naval power. On this basis Great Britain would at present have as much power as all of the larger nations combined. While it is unlikely that nations will agree to a complete elimination of navies, we recommend that all practicable steps be taken to build up the American merchant marine to a size commensurate with the size of the Navy and proportionate to the size and wealth of this country.

"As the merchant marine will be called on in time of war to support the Navy, there should be close co-operation in time of peace between the departments of the Navy and the merchant marine. In order to aid our merchant marine, as well as to economize on naval expenses and to train regular Navy personnel on combatant ships, we recommend that auxiliary vessels required for naval purposes in time of peace be chartered from well-established merchant lines.

"We desire to see at least 50 percent of the trade of this country carried in American-built ships flying the American flag and manned by American officers and men all of whom shall live like Americans. To this end we again solemnly pledge our best efforts."



*Looking Aft on the Forward Deck of the
Savannah Liner City of Chattanooga
Showing the Steel Cargo Booms*



New Savannah Liner City of Chattanooga

New Savannah Liner Added to Atlantic Coastwise Fleet

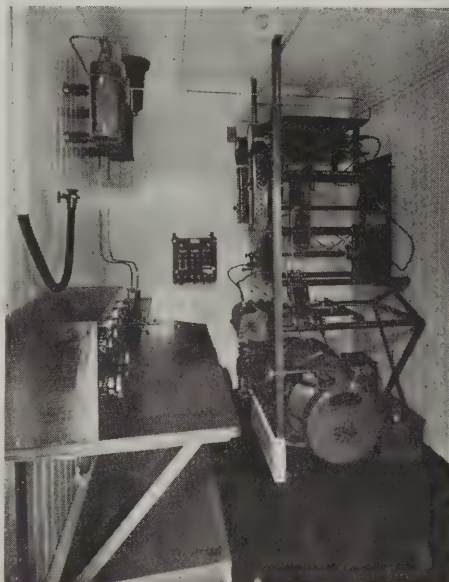
The City of Chattanooga, First of Two Sister Ships Built at Newport News for the Ocean Steamship Company, Goes Into Service

THE accompanying photographs and plans give a good idea of the S. S. *City of Chattanooga*, the latest addition to the Ocean Steamship Company's fleet. This fine vessel was placed in the New York-Savannah service early in October and will be followed this month by her sister ship, the *City of Birmingham*.

Built by the Newport News Shipbuilding and Dry Dock Company, Newport News, Va., to the highest class of the American Bureau of Shipping, the *City of Chattanooga* may be taken as the "last word" in American coastwise vessels. While the general arrangement is similar to that of the *City of St. Louis* and *City of Montgomery* it will be noted that an additional deck, the boat deck, has been fitted as well as other additions, both in structure and equipment.

The general dimensions and particulars of the ship are as follows:

Length overall	401 feet
Length between perpendiculars	382 feet
Beam, molded	52 feet
Depth, molded, to hurricane deck.....	35 feet
Depth of double bottom.....	3 feet 6 inches
Load draft	18 feet 6 inches
Load displacement	7,180 tons
Approximate deadweight at 18-foot 6-inch draft	3,500 tons



Wireless Room

Cargo capacity	323,596 cubic feet
Bunker capacity	457 tons
Tonnage, gross	5,861
Tonnage, net	4,343

The hull is constructed of steel with six watertight bulkheads, inner bottom from fore to after peak bulkheads and four plated decks—the orlop, lower, main and hurricane. The shell is plated with in-and-out strakes, the frames being joggled over the landing edges. The decks, in cargo spaces, are supported by girders and wide-spaced stanchions.

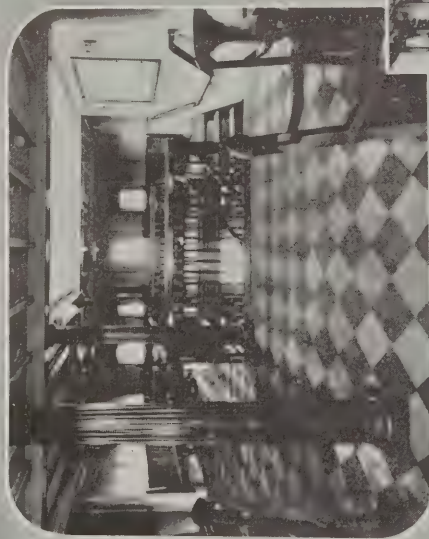
The entire hurricane and promenade decks are given over to passenger accommodation, provision being made for 164 first and 40 second class passengers.

There are 72 first class staterooms equipped with berths, the upper berths being of the Pullman type. Each of these rooms is provided with a 12-inch electric fan, hot and cold running water

and a steel thermos bottle for drinking water.

In addition to the berth rooms, there are ten suites, each of which is equipped with twin beds, bureau, wardrobe and private bath.

There are also eight private bathrooms, so arranged in conjunction with the ordinary staterooms that they may be placed at the disposal of occupants of connecting rooms, thus



Lobby and Stairway

Main Dining Saloon



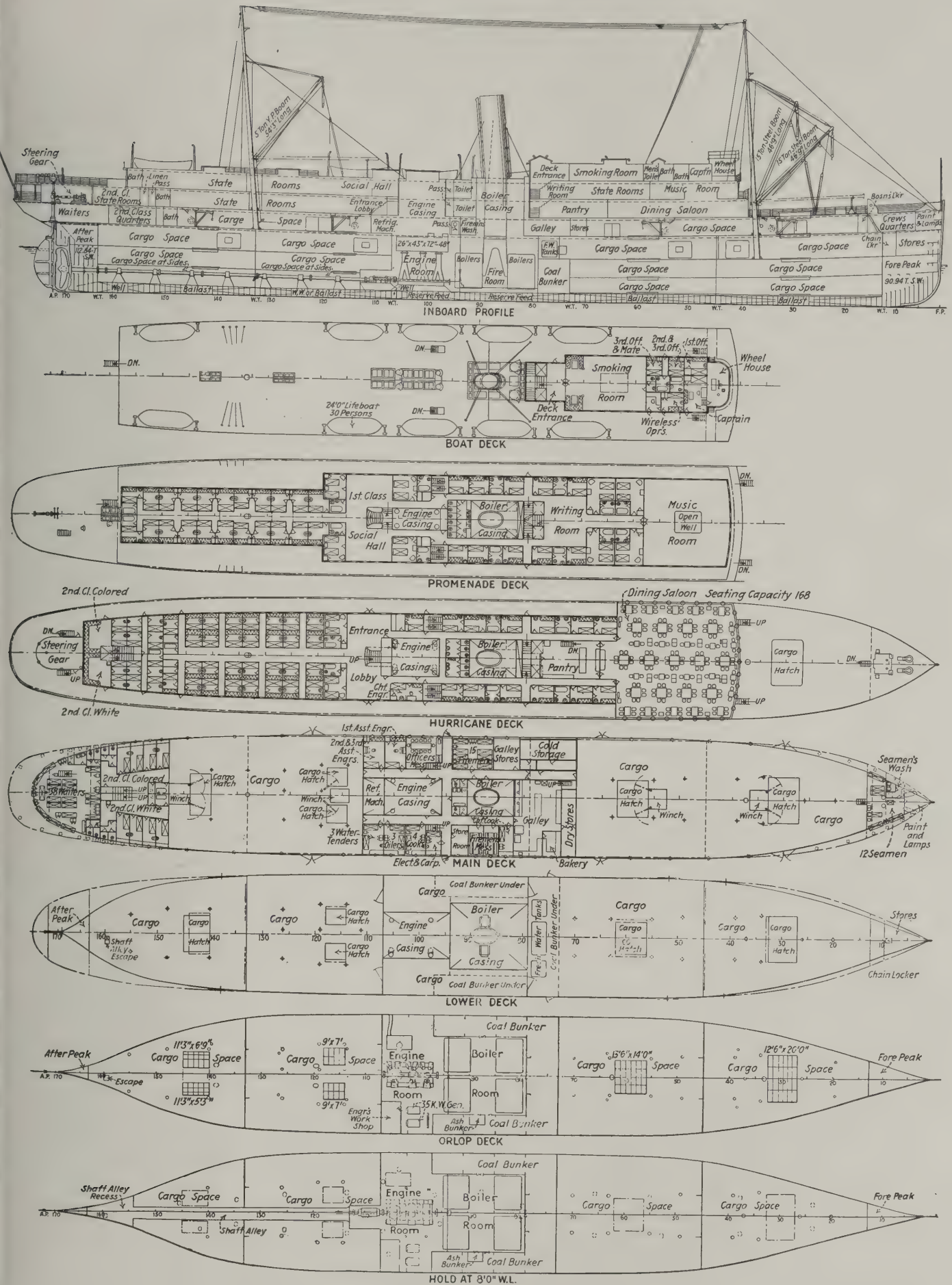
Smoking Room

Pantry

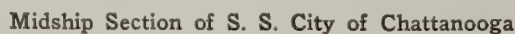


Promenade Deck
Pilot House
Music Room





Inboard Profile and Deck Plans of S. S. City of Chattanooga



Summary of Cargo Space

Between Frames	Space	Net Cubic Feet	Total Cubic Feet
13-45	Ceiling to orlop deck.....	15,073	
45-73	Ceiling to orlop deck.....	19,188	
107-133	Ceiling to orlop deck.....	14,302	
133-154	Ceiling to orlop deck.....	6,538	
Total			55,101
13-45	Orlop deck to lower deck.....	18,428	
45-73	Orlop deck to lower deck.....	22,982	
107-133	Orlop deck to lower deck.....	21,132	
133-163	Orlop deck to lower deck.....	16,520	
Total			79,062
13-45	Lower to main deck.....	25,928	
45-79	Lower to main deck.....	31,935	
79-107	Lower to main deck.....	13,006	
107-133	Lower to main deck.....	24,825	
133-163	Lower to main deck.....	24,633	
Total			120,327
14-70	Main to hurr. deck.....	40,787	
111-148	Main to hurr. deck.....	28,319	
Total			69,106
Total cargo space.....			323,596

NOTE—Capacities of compartments are figured from top of ceiling on tank top and top of plating on decks to bottom of beams at top, to cargo battens at sides and to bulkheads at ends.

Summary of Tanks

Between Frames	Tank	Gallons	Tons Salt Water	Tons Fresh Water
F.P.-13	Fore peak	23,809	90.94	.....
13-45	Inner bottom, No. 1 P.....	17,378	66.38	.....
13-45	Inner bottom, No. 1 S.....	17,378	66.38	.....
45-73	Inner bottom, No. 2 P.....	28,275	108.00	.....
45-73	Inner bottom, No. 2 S.....	28,275	108.00	.....
73-94	Inner bottom, No. 3 P.....	23,449	87.08	.....
73-94	Inner bottom, No. 3 S.....	23,449	87.08	.....
94-106	Inner bottom, No. 4 P.....	13,236	49.15	.....
94-106	Inner bottom, No. 4 S.....	13,236	49.15	.....
107-133	Inner bottom, No. 5 P.....	22,894	87.45	89.94
107-133	Inner bottom, No. 5 S.....	22,894	87.45	89.94
133-154	Inner bottom, No. 6 P.....	7,213	27.55	.....
133-154	Inner bottom, No. 6 S.....	7,213	27.55	.....
163-A.P.	After peak	29,542	112.84	.....
Total		278,241	782.54	272.46
76-79	Fresh water tank on C. L.....	5,092	.....	18.91
76-79	Fresh water tank on port.....	2,504	.....	9.29
76-79	Fresh water tank on stb'd.....	2,504	.....	9.29
92-94	Service tanks	400	1.53	1.48
Grand total		288,737	784.07	311.43

NOTE—7.48 gallons = 1 cubic foot, 35 cubic feet salt water = 1 ton, 36 cubic feet fresh water = 1 ton.

Coal Bunker

Between Frames	Space	Net Cubic Feet	Tons
73-97	Port., stb'd and C. L.....	19,219	457.62

Ash bunker, 201 cubic feet, 4.79 tons.
NOTE—Capacity of coal bunker is figured to shell, internals deducted.
42 cubic feet = 1 ton coal.

Equipment

Two 7,665-pound stockless bower anchors.
One, 2,765-pound stockless stream anchor.
270 fathoms 2½-inch stud link chain cable.
90 fathoms 4½-inch circumference steel wire stream line.
120 fathoms 5-inch circumference steel wire tow line.
Two 90-fathom, 8-inch circumference manila hawsers.
Two 90-fathom, 7-inch circumference manila warps.

Scantlings

FRAMES: Spaced 24 inches in peaks, 27 inches elsewhere.
Frames outside double bottom, 6-inch by 3.5-inch by 18-pound channels, from peak to peak, extending to main and hurricane decks alternately aft of frame No. 41; with every frame carried up to hurricane deck forward.
Frames in peaks, 6-inch by 3½-inch by 11.7-pound angles with reverse bars.
Frames inside double bottom, 3½-inch by 3-inch by 9.1-pound angles throughout on solid plate floors; 6-inch by 3.5-inch by 3.5-inch by 15.3-pound channels on open floors.
REVERSE FRAMES: On frames in peaks, 3½-inch by 3-inch by 7.9-pound angles in fore peak to hurricane deck on every frame, in after peak to main deck on every frame.
Inside double bottom, on solid plate floors, 3-inch by 3-inch by 8.3-pound angles in holds to 3½-inch by 3-inch by 9.1-pound angles in machinery space. Double under main engine and boiler bearers. Six-inch by 3.5-inch by 3.5-inch by 15.3-pound channels throughout on open floors.
FLOORS: Inside double bottom solid plate floors forward of three-fifths length amidships, in engine and boiler rooms and under outer ends of watertight bulkhead stiffener brackets. Solid floors on every third frame elsewhere with intermediate open floors.
Solid floor plates and brackets on open floors .35-inch in holds, .40-inch in engine space, .46-inch in boiler space.
Floors in peaks, .35-inch; watertight, .38-inch; tank end floors .38-inch.
LONGITUDINALS INSIDE DOUBLE BOTTOM: .34-inch in holds; .40-inch in engine space; .46-inch in boiler space.
DOUBLE BOTTOM PLATING: Center strake and margin .48-inch for ¼ length amidships; .625-inch in machinery space; .40-inch at ends. Margin, 31 inches minimum width, exclusive of flange; center strake, 47 inches wide; other strakes, .40-inch ½ length and ends; .625-inch engine space; .625-inch boiler space.
Riveting: Center strake and margin, treble riveted butt laps, ¾-inch rivets for ½ length amidships; treble riveted butt laps, ¾-inch rivets M. S.; double riveted butt laps, ¾-inch rivets at ends. Other strakes, double riveted butt laps, ¾-inch rivets in machinery space to double riveted butt laps, ¾-inch rivets.
STEM: 8¾ inches by 2½ inches.
STERN FRAME: Rudder post, 8 inches by 7½ inches.
PROPELLER POST: 9¾ inches by 7½ inches below boss, 8 inches by 7½ inches above.
RUDDER STOCK: 10 inches diameter.

forming suites for the accommodation of two, four or six people.

Public baths are located on both hurricane and promenade decks, in addition to the private baths before mentioned, and all baths, private and public, are supplied with hot and cold salt and fresh water, and have a shower over each tub.

The public rooms are unusually commodious and are tastefully finished and decorated.

The dining saloon extends the full width of the ship, seats being provided for all passengers at one sitting. The pantry and galley are particularly well arranged for giving prompt service without encroaching upon the entrance passageways, and the grouping of mess rooms, galley stores and refrigerators is such as to give efficient service with the minimum personnel.

The music room is located directly over the dining saloon with a center well opening into the latter. It is supplied with a piano and phonograph and has abundant seating capacity tastefully arranged.

The smoking room is located on the boat deck, an innovation in the Ocean Steamship Company's vessels, made to meet the wishes of those who use the room as well as those who do not.

The joiner trim throughout the first class quarters is of natural mahogany combined with white and gold. The main stairways are paneled in mahogany and have ornamental iron balustrades. The smoking room is finished in fumed oak paneling and has an ornamental glass dome.

With the exception of the music room, which is carpeted,

all floors of staterooms, passages and public rooms are covered with "Everlastic," cork or rubber tile.

An automatic fire alarm system is fitted in all staterooms, public rooms and cargo holds.

The provisions for handling and stowing cargo reflect the advance in this department of ship construction. Among these may be noted the increase in height of cargo ports, to ensure the safe and expeditious handling of automobiles.

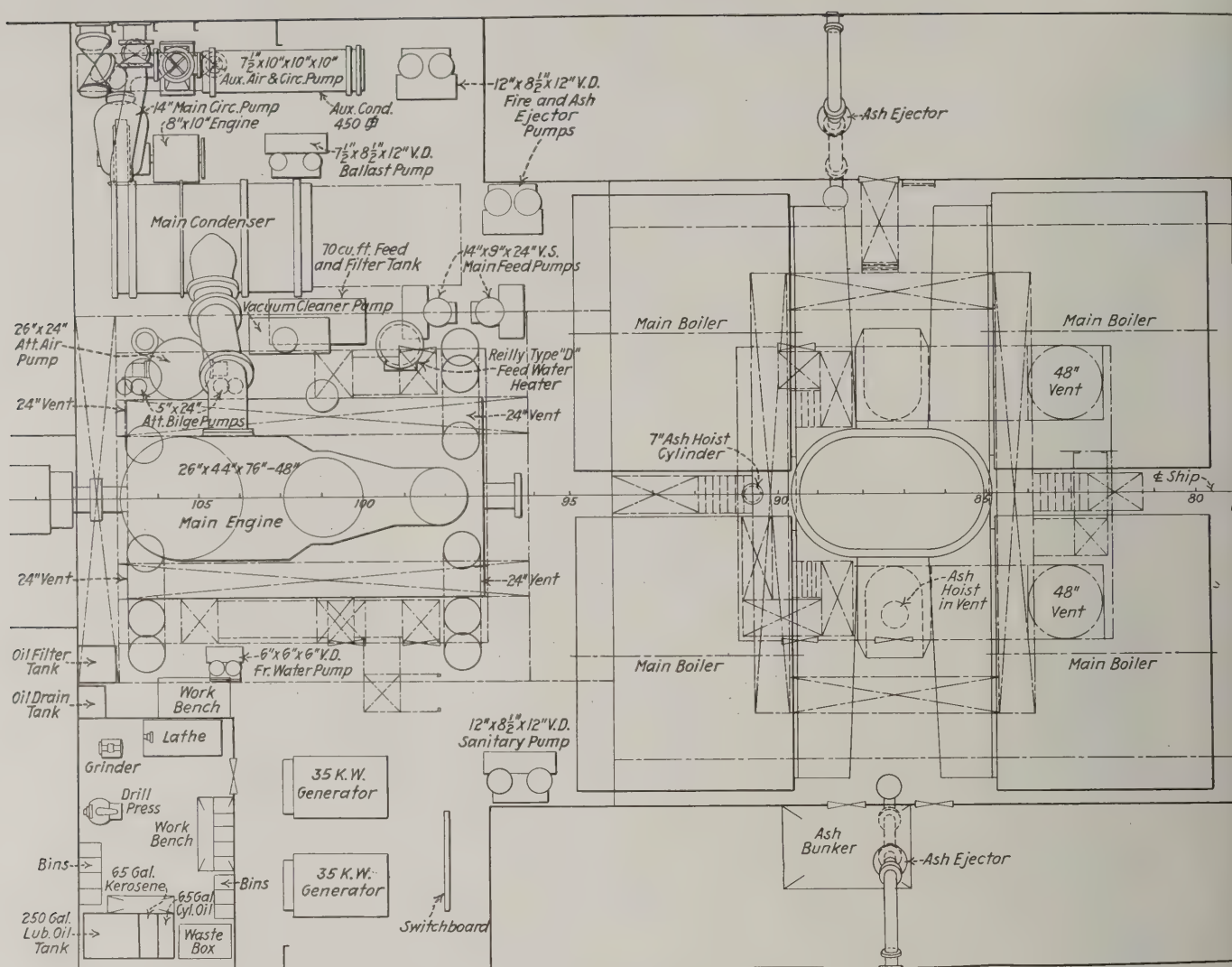
PROPELLING MACHINERY

The propelling machinery consists of a triple expansion, surface condensing engine having cylinders 23 inches, 43 inches and 72 inches in diameter and 48 inches stroke, designed to develop 2,900 indicated horsepower at 75 revolutions per minute and 200 pounds per square inch working pressure. With this power the ship is capable of a speed of over 12½ knots at normal load draft. The valve gear is of the Stevenson link type with direct acting steam reversing gear. An Edwards air pump, 26 inches in diameter by 21 inches stroke and two bilge pumps, 5 inches diameter by 21 inches stroke, are driven off the main engine. All other pumps are independent.

The crank shaft is 14¾ inches in diameter; thrust, 14¾ inches; line, 13¼ inches and tail shaft 14¾ inches with continuous brass liner.

The propeller is of built-up type, 16 feet in diameter, with cast iron hub and four bronze blades.

The main condenser is circular with cast iron body and approximately 4,100 square feet of cooling surface.



S. S. City of Chattanooga: Plan of Machinery Space

The following auxiliaries are installed:

Centrifugal circulating pump, 14-inch suction and discharge driven by single engine 8 inches diameter by 10 inches stroke.

Auxiliary condenser, 450 square feet cooling surface.

Steam pumps, built by the Warren Steam Pump Company:

2 main and auxiliary feed, single vertical, 14 inches by 24 inches.

2 fire and bilge, duplex vertical, 12 inches by 8 1/2 inches by 12 inches.

1 ballast, duplex vertical, 7 1/2 inches by 8 1/2 inches by 12 inches.

1 sanitary, duplex vertical, 12 inches by 8 1/2 inches by 12 inches.

2 fresh water, duplex vertical, 6 inches by 6 inches by 6 inches.

1 drinking water, duplex horizontal, 3 inches by 2 inches by 3 inches.

1 auxiliary air and circulating combined, 8 inches by 10 inches by 10 inches by 12 inches.

1 ammonia condenser, circulating, duplex horizontal, 4 1/2 inches by 3 3/4 inches by 4 inches.

There is a Reilly multi-coil feed water heater, a combined feed and filter tank of approximately 70 cubic feet capacity and two 2 1/2-inch Metropolitan injectors.

The boilers are four in number, of single end Scotch type, 14 feet 9 inches diameter and 11 feet 6 inches long, over heads; constructed for a working pressure of 200 pounds per square inch. Each boiler has three 46-inch Morison furnaces, connected to separate combustion chambers. The furnaces are fitted to burn coal under natural draft.

The engineers' work shop is provided with a 9-inch engine lathe, drill press and grinder, all motor driven.

The electric plant consists of two 35-kilowatt General

Electric generating sets and, in addition, a 10-kilowatt emergency set with gasoline engine by the Matthews Engineering Company. In all there are approximately six hundred 40-watt lamps installed on the vessel, including twelve cargo clusters, and an 18-inch searchlight.

Two Brunswick-Kroeschell 4-ton refrigerating machines are installed for cooling ship's provisions and drinking water.

In general, the *City of Chattanooga* is completely outfitted and equipped as becomes a first class passenger and cargo steamer, and is a notable addition to the coastwise fleet.

Two Important Repair Jobs

THE S. S. *Hoven*, a fine steel tank steamer of approximately 10,000 tons deadweight capacity which was built by the Bethlehem Shipbuilding Corporation, Ltd., at Sparrow's Point, Md., in 1919, struck a submerged rock off San Benito Island on August 29 with the results shown in the illustration.

Such was the force of the blow that practically the entire structure in way of the forepeak, from the 16-foot waterline down, and extending aft for a distance of over 30 feet was destroyed, both the forepeak bulkhead and the forward end of the centerline bulkhead being included in the damaged area. Had the ship been an ordinary cargo steamer, she

would probably have foundered, but because of the extensive subdivision characteristic of tank steamers, she remained afloat and we understand made port under her own steam.

As indicating the extent of the repairs made necessary by the accident, the following particulars are of interest:

- New stem bar from 18-foot waterline to forefoot.
- 29 shell plates removed and replaced by new.
- 4 shell plates removed and faired.
- 11 transverse floor plates with accompanying intercostals, clips, etc., removed and replaced by new.
- 2 web transverses partially renewed.
- 18 longitudinals partially renewed and faired.
- 3 lower strakes of forepeak bulkhead renewed.
- 2 lower strakes of centerline bulkhead renewed at forward end.
- 16 breasthooks renewed or faired.

The repairs are being carried out by the Los Angeles Shipbuilding Company at a price of approximately \$64,000. It



Damage to Bow of S. S. West Arrow Above Waterline



Crumpled Bow of Tank Steamer Hooven

should be noted that this figure covers some bottom damage not shown by the illustration.

Of quite different origin, but of very nearly as serious a character is the damage shown by the two illustrations of the S. S. *West Arrow*. This vessel, a Shipping Board cargo steamer of 8,567 tons deadweight built by Skinner and Eddy, Seattle, Wash., in 1918, was run into by the British S. S. *Haverford* while on a voyage from European ports to Boston. The *Haverford*, a steamer of 11,635 gross tons, was moving at a good rate of speed and apparently struck the *West Arrow* very nearly end on. Thanks to the good material and workmanship of the latter vessel, the structural damage was practically confined to the forepeak, although the ship received a thorough shaking up and the propelling machinery was somewhat disarranged, but not sufficiently to prevent the ship from steaming into Boston, where she was dry docked.

The following is an outline of the repairs made necessary by the collision:



Damage to Bow of S. S. West Arrow Below Waterline

- 36 shell plates removed and replaced by new.
- 8 shell plates removed and faired.

New stem bar and forefoot casting, complete.
 10 frames and reverse frames renewed from keel to fore-castle deck.
 1 hawse pipe casting renewed.
 7 fore-castle deck beams renewed.
 15 main deck beams renewed.
 Chain locker renewed.
 Forepeak tank top and bulkhead, extensive renewals and fairing.
 Turbine and gear casing raised for inspection.

Line shaft couplings to be broken and bearings opened up and adjusted.

The contract for this work has been awarded to the Robins Dry Dock & Repair Company, Brooklyn, N. Y., for \$47,970, the time allowed for completing the work being 38 days. In addition to the repairs, this figure covers cleaning the ship's bottom, painting two coats, and ordinary voyage repairs.

British Shipowners Face Keen Competition Abroad

Rapid Growth of New North German Lloyd Fleet — Proposals Advanced for Equalizing Operating Costs—Advantages of the Motorship

By W. H. Wendon

THE question of competition with German and other foreign shipowners is the subject uppermost in the minds of British shipping people at the present time. And in this regard a startling instance has been cited. Sir Fortescue Flannery, a leading consulting marine engineer, estimates that there is a difference of £2,000 in wages on a round-trip in the Europe-South American trade—of course to the advantage of the German shipowner, whose success in this achievement is brought about by cheap coal, cheap stores and light taxation. But, judging from the rapidity with which the German shipping concerns are augmenting their merchant fleets, the competition in the future will be on still more pronounced lines.

THE NEW "N. D. L." FLEET

Take the case of the Norddeutscher Lloyd. According to official data, the "N. D. L.," as it is more generally known, at all events on this side, is making satisfactory progress in the reconstruction of its fleet and the restoration of its overseas connections. Of the 23 ships which were under construction at the beginning of the 1922 business year, seven steamers, of 49,500 tons, were last year completed and taken into service. The building program has been extended by the addition of two cargo steamers, totaling 12,000 tons gross. Further, the passenger and cargo steamer *Bremen*, of 10,826 tons gross, has been acquired. But that is not all. In the course of this year the steamers *Munchen*, of 13,325 tons gross; *Werra*, of 9,475 tons gross; *Ludwigshafen*, of 5,918 tons gross, and *Aachen*, of 6,274 tons gross, have been completed and taken into service, while the 32,000-ton *Columbus*, so far Germany's largest merchant vessel, is the most recent addition. Furthermore, there are still nine steamers, of about 110,000 tons gross, under construction for the "N. D. L.'s" account.

Well may British (and other) shipowners view with considerable concern the coming competition of the German shipping lines, of which, of course, the Norddeutscher Lloyd is but an example. By the middle of the present year, such progress had been made with the restoration of the N. D. L.'s services that the system comprises a weekly service of passenger and cargo steamers to New York, a service of passenger and cargo steamers every three weeks to Brazil, a monthly service to the Far East, and a service every three months to Australia. Most significant of all is the official prediction that for the current business year a satisfactory business result may be anticipated.

BRITISH SHIPBUILDING NEEDS SUPPORT

Apprehension of this increasing competition of German shipping is apparent in various quarters, but only very occasionally are views put forward showing the feeling that lies beneath the surface. It is not unnatural, therefore, that the opinion expressed by Lord Aberconway, head of the famous

shipbuilding and engineering firm of John Brown and Company, of Glasgow, should have received at the hands of United Kingdom shipping people in particular, and business men generally, a large measure of attention. Lord Aberconway's views on the shipping, shipbuilding and engineering position are interesting, though depressing. He considers that, regarded from a commercial, as well as from a political, point of view, there never was a time when the shipbuilding and engineering trades in the United Kingdom were in greater need of support. He does not remember, in forty years' experience, any period in which there was such a depression. The great shipowning companies, he points out, have more tonnage than they know what to do with. Many of the vessels, especially in the North Atlantic trade, are crossing at a loss except in the busy passenger season, so that the shipowning trade is not in a position to build more ships. The balance sheets show millions of pounds' worth of bills outstanding, and, so far from placing new orders, a great number of firms are paying large sums to get out of contracts. In regard to engineering works, very much the same sort of thing applies.

WHAT GERMAN COMPETITION MEANS

So much for a bird's-eye view of the shipping and industrial position. But it is when he comes to the cause or causes of this depressing situation that Lord Aberconway lets himself go. Asking: "Will trade come to this country, or will Germany get it?" Lord Aberconway quotes a recent contract for a ship, when the tender from a British firm was 40 percent higher than the quotation of a German firm. This means, he says, that Germany can build tonnage at half the cost we can in this country, and he thinks that this reflects the international position. Apropos the marked disparity between British and German costs, Lord Aberconway lays it down that—

"Germany has perpetrated the most enormous swindle the world has ever seen in the depreciation of the mark. She has been seeking for gold in every market—European, Asiatic, American—and there are from 450 to 500 million sovereigns banked in Brussels, New York and elsewhere to the credit of German swindlers. They are the great industrial leaders in Germany. They have spent money in putting their undertakings in order, and in putting in the most expensive machinery and every appliance that modern science can devise out of the money of which the whole world has been robbed. Every form of indebtedness has disappeared, including her debentures and her mortgages, and they have no charges to meet. We must face the problem now presented."

It needs no words of mine to make it clear that Lord Aberconway, at all events, has some very definite views as to the gravity of German competition.

GREEK SHIPOWNERS PAY CREWS LOWER WAGES

One turns, perhaps with a feeling of relief, to shipping competition from another quarter—Greece. Here the ad-

vantage enjoyed by Greek shipowners as compared with British shipowners turns on the question of wages. Two examples will suffice to reveal that in this matter Greece is a competitor of some caliber. Tabulated, the figures are as follows:

(1) Greek steamer, 4,800 tons deadweight. Crew 22. Daily wages bill £6 13s. 4d.	(1) British steamer. 4,200 tons deadweight. Crew 25. Daily wages bill £9 1s. 6d.
Vessel's daily cost, including provisions and stores, but excluding insurance, £12.	Vessel's daily cost, including provisions and stores, but excluding insurance, £14 13s.
(2) Greek steamer. 8,000 tons deadweight. Crew 32. Daily wages bill £11.	(2) British steamer. 6,600 tons deadweight. Crew 32. Daily wages bill £12 9s.

It is in the matter of wages of the crew, as distinct from those of the officers and engineers, that Greek shipowners are able to effect economies. The captain of the Greek 8,000-tonner referred to in the above table receives £26 a month, or 30s. a month less than the master of the British 6,600-tonner. The other wages compare as follows:

Greek steamer. Mate, £20 a month, Second mate, £16 a month. *Chief engineer, £25 a month. Second engineer, £20 a month.	British steamer. Mate, £20 10s. a month. Second mate, £16 10s. a month. Chief engineer, £23 10s. a month. Second engineer, £20 10s. a month.
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*A Britisher.

The third engineer on each vessel receives the same wage, but, while no fourth engineer is carried in the Greek boat, one is employed in the British steamer. The Greek boat's seamen and firemen are paid £2 to £3 per month less than the Britishers, and the steward £4 10s. a month less, while a mess-room boy receives £4, against £8 10s. paid to a mess-room steward on the British boat. These figures obviously speak for themselves.

HOW GREAT BRITAIN PROPOSES TO EQUALIZE MATTERS

Reverting to the general position apropos foreign competition, two proposals have been put forward in United Kingdom shipping circles with a view to equalizing matters. The first of these suggestions is that the union leaders of the seamen should propound a scheme to enable British shipowners to operate the vessels at present laid up or to be laid up, the seamen to accept lower wages—but not so low as on the Greek boats cited, but more nearly representing the pre-war wage, plus the increase in the cost of living. The second proposal is that the government, without infringing on the principle of Free Trade, should tax foreign steamers to the extent of the difference in the rate of wages paid on the respective British and foreign boats.

PROPOSAL FOR GOVERNMENT CREDITS FOR BUILDING MOTORSHIP TONNAGE UNFAVORABLY RECEIVED

A suggestion that the British Government should grant credits to shipowners in connection with the building of motorship tonnage has excited attention in shipping circles, but, judging from its reception, its author might well have left the subject alone, thus saving himself time and thought. He urged that, with the larger volume of motorship tonnage which British shipowners will eventually require, if they are to hold their position in the sea carrying trade, the government should place national credit at the disposal of the shipowners. This, of course, was a direct invitation to the government to take a hand in the future conduct of the British mercantile marine, and, frankly, the British shipping community has expressed its unqualified disapproval of any such course being adopted.

A leading shipbuilder fears that the proposal would not be likely to provide a great deal of employment for shipbuilders in the near future. No doubt, he says, the transition

from steam to internal combustion engines will come about in time, but it will be a slow and gradual process. "Internal combustion engines," says this authority, "are still in a large measure in the experimental stage, and shipowners will not, I imagine, be prepared to embark on extensive programs until they feel more sure of their ground."

A shipowning expert, in voicing his doubts as to the practicability of the proposal, cites the Chamber of Shipping view that shipping should be left alone to develop along its own lines.

SIR ALFRED YARROW SAYS TRAMP VESSELS DESTINED TO BE MOTORSHIPS

Touching on the internal combustion engine, Sir Alfred Yarrow, the famous shipbuilder, states, with regard to Diesel engines, that there is not the slightest doubt that, as long as the oil supplies of the world last, engines of this type will replace those of steam in tramp steamers and other vessels of the same character. In the first place, he says, owners will be inclined to use Diesel engines to maintain a more efficient and cheaper service, and, secondly, because the space and weight saved by carrying less oil fuel gives increased facilities for carrying greater quantities of cargo. Sir Alfred Yarrow thinks that there is also a future for oil engines in passenger ships, but, as for a vessel of the *Beren-garia* type, he considers it will be a long time before they have that means of propulsion. Perhaps his most interesting view, however, is that, within the next twenty years all "tramp" steamers will be running on Diesel engines, unless there are any new discoveries in the intervening time. There is, he thinks, the possibility that, if oil fails to last, owners will have to increase their prices for freight—"which would be a big drawback all round"—but he is of opinion that, for steamers of eleven or twelve knots, the Diesel engine is ideal.

COMPARATIVE OPERATING RESULTS OF MOTORSHIP AND STEAMER

To pursue the question of the advantages or disadvantages (if any) of Diesels, striking comparisons have been drawn here between the operating results of a Diesel-engined vessel, an oil burner and a vessel burning coal. An analysis of these three types of vessels indicates to a marked degree that the balance of profit is decidedly in favor of the vessel driven by Diesels—not, of course, on all voyages, but on those where long distances have to be covered.

The case is quoted of a Diesel-engined vessel which has completed a round voyage occupying more than 160 days. During this period her average daily profit was approximately £4, which, on the surface, is in all truth a small amount, but is, in fact, considerably in excess of the sum gained by vessels of other types. Thus, the receipts of an oil burner would have been reduced by rather more than 6 percent owing to cargo being shut out, and, allowing for minor advantages, such as lower disbursements and reduced insurance premiums, the net result of this oil burner's voyage would be a loss exceeding £3,000, or about £19 per day. The coal-burning steamer's voyage would compare even more unfavorably with the Diesel boat. The larger amount of coal carried would reduce the gross freight by 9.61 percent, and finally the round voyage would show a loss of about £7,400, or nearly £47 per day. To sum up, therefore, the oil-burning steamer would lose nearly £7,000 in a year and the coal burner at the rate of £17,000, while the Diesel vessel would earn the small, but acceptable, profit of £1,460 per annum, ignoring, of course, depreciation or capital interest.

On the general question of Diesels, the big question remains the extra initial cost of construction. Statistics such as those cited above would seem to show that this greater first cost to build is well worth while; but shipowners are not so sure about it, and, frankly, they will take a deal of convincing.

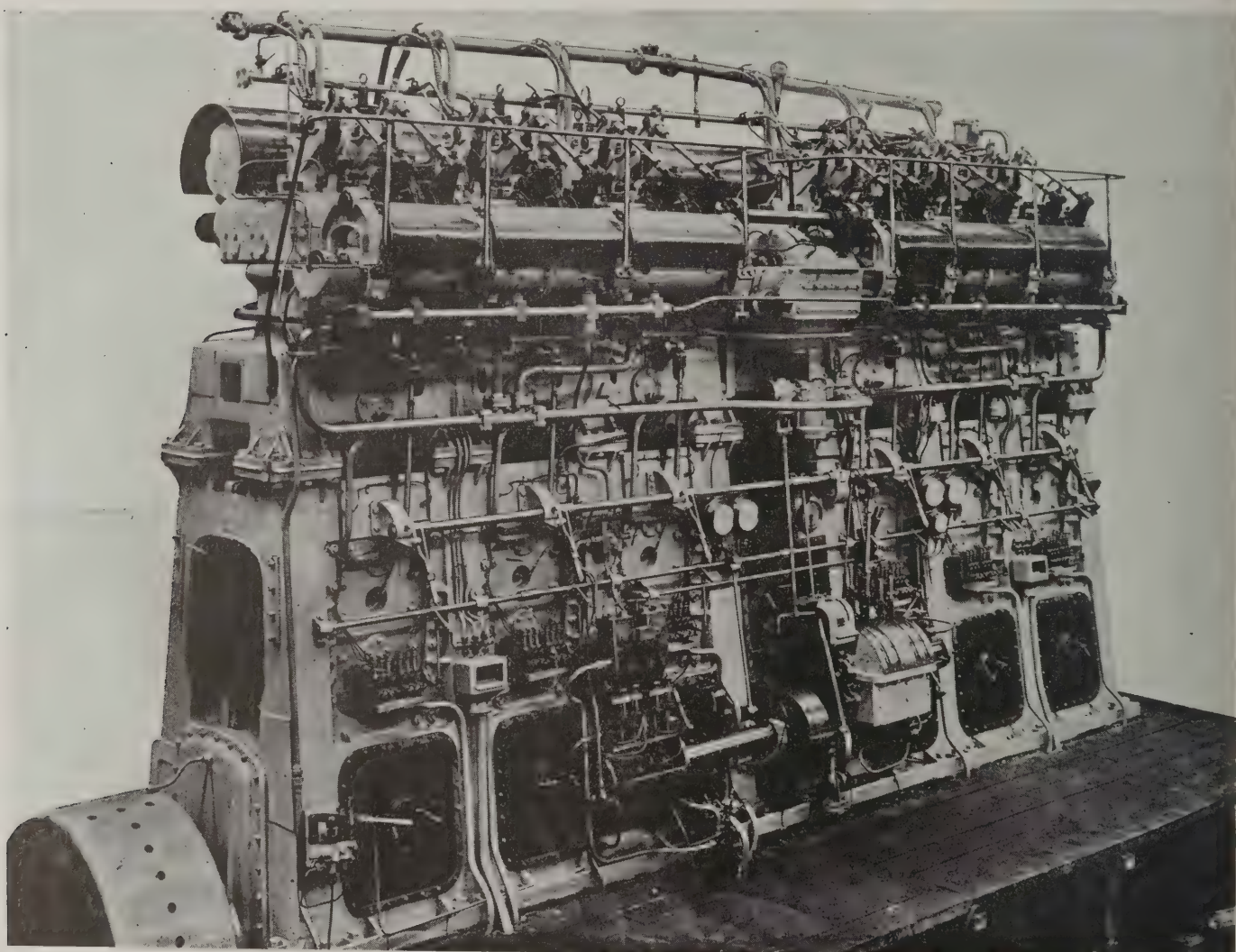
First British-Built Diesel Electric Ship Completes Trials

The Fruit Carrier *La Playa* Is Equipped with Four Camellaird Fullagar Units — New Vickers and Sulzer Oil Engines

By Our Special London Correspondent

IT cannot be said that European shipowners are very favorably disposed towards the adoption of Diesel electric propulsion. Their general opinion is that this involves additional complication, with the result that upkeep costs are higher, and a larger engine room staff may be needed. They fear moreover that the price of the machinery would be high, and they have a conservative objection to the employment of fast running Diesel engines coupled to generators.

the order of American owners, namely the United States Fruit Company of Boston. Incidentally, it is somewhat curious to note how many of the recent motorship orders placed either directly or indirectly on behalf of American interests are being executed in European yards. In addition to the three craft mentioned, the Pacific Mail Steamship Company has two passenger and cargo motorships on the stocks at Gothenburg, the Standard Oil Company has ordered



New Standard 600 Brake Horsepower Vickers Oil Engine

They therefore prefer the slow-running Diesel motor, direct coupled to the propeller shaft, and are not greatly impressed with the claim of the advocates of the Diesel electric system that reliability is increased, since the power is distributed over several units instead of one, or, at most, two.

MOTORSHIPS BUILDING IN EUROPE FOR AMERICAN OWNERS

Nevertheless, the greatest interest has been evinced in the new Diesel electric ship *La Playa* which has just been completed at Cammell Laird's yard at Birkenhead and has run a series of very prolonged trials. It is significant, however, that this vessel, which is the first of three sister ships, is to

motor tankers from Krupps, two 20,000 ton ore carriers, now being built in Germany for Mr. Dan Brostrom, the Swedish shipowner, will be operated on behalf of the Bethlehem Ore Company, while two other motor cargo ships now being constructed in England are for an American concern.

DIESEL ELECTRIC SHIP HAS GREATER CARGO SPACE

The *La Playa* is in many respects a remarkable vessel, and probably represents the most interesting example of Diesel electric propulsion that has yet been seen in any country. She is designed essentially for fruit carrying, has a capacity of 5,000 tons and has the relatively high speed of 14 knots,

speed being of course such an important factor in ships engaged in this trade. The length is 325 feet, the beam 48 feet, and the depth 31 feet 9 inches. The striking claim is made that in spite of the fact that four generating units are installed, there is actually larger cargo carrying space in this ship than in an ordinary motor vessel, mainly on account of the fact that there are no long propeller shafts and shaft tunnels between the main engines and the propellers.

Fitted in the engine room are four Diesel driven dynamos of 500 kilowatts each, the engines being of the four cylinder Camellaïrd Fullagar opposed piston type, each developing 750 brake horsepower and having cylinders 14 inches in diameter, with a combined piston stroke of 36 inches. They run at the fairly high speed of 250 revolutions per minute, being thus very much lighter than the normal slow speed marine direct coupled type. This accounts for the fact that there is very little difference in the machinery weight of this ship as compared with a normal motor driven vessel.

GENERATORS

Each engine actually drives two dynamos, for in addition to the main generator previously referred to, there is an auxiliary of 200 kilowatts output. These auxiliary dynamos supply the necessary power for auxiliary purposes, since electrical machinery was used throughout and there is no boiler on the vessel. It might be thought that four auxiliary generating sets developing a total of 800 kilowatts represents an excessive amount, but the demands for the refrigerating plant are very heavy and are estimated at some 500 horsepower. This is all provided from the auxiliary generators, so that there is no necessity to install auxiliary Diesel driven dynamos which is the usual arrangement of a motor vessel.

Direct current transmission is adopted but the main generators, each operating at 220 volts, being coupled in series thus supply current at 880 volts to the 2,500 brake horsepower electric motor, which is direct coupled to the propeller. Speed control and reversal are accomplished by varying the stroke and direction of excitation of the fields of the main generators, and normally the propelling motor runs at 90 revolutions per minute.

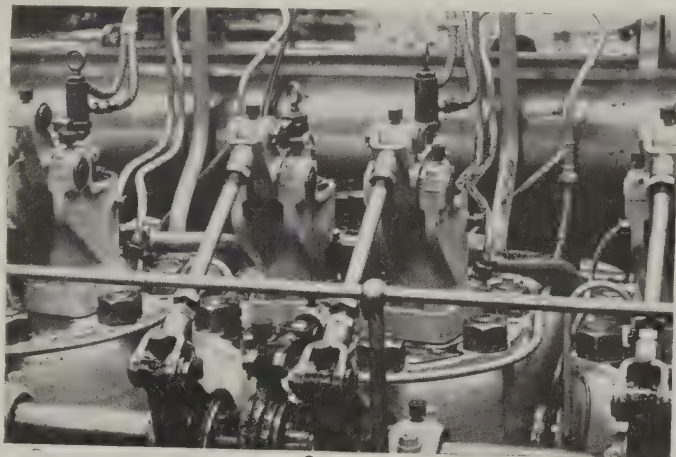
VICKERS BRINGS OUT A 600 HORSEPOWER DIESEL

Although most of the leading British Diesel engine manufacturers concentrate their attention on the construction of motors of 1,000 brake horsepower and upwards, in one or two cases types of smaller power are standardized, as it is thought there is a field for engines of 500 to 600 brake horsepower for installation in small vessels, such as coasters and similar craft. It is with this object in view that Vickers have just brought out a new standardized model of 600 brake horsepower in six cylinders, and the first example is being fitted in a small mixed cargo and passenger vessel recently built for Japan. This is all the more interesting as it indicates competition between Diesel and semi-Diesel engine builders, since motors of the latter class are now being constructed up to 600 brake horsepower as instanced in the Beardmore and Kromhout designs which have already been described in this journal.

The latest Vickers engine is a pure Diesel with their well-known system of solid injection. It has cylinders $18\frac{1}{4}$ inches diameter and 27 inches stroke, and the speed is 150 revolutions per minute. It must be admitted that at first sight it appears somewhat complicated in comparison with a semi-Diesel as it has all the accessories, the valve gear and reversing mechanism of a Diesel motor five or six times the power.

There is a set of fuel pumps seen on the left of the control station, delivering fuel to the fuel valves at 4,000 to 5,000 pounds per square inch, one of which is located in each cylinder cover. The speed is controlled by altering the lift of the fuel valves, this operation being carried out by means of a lever at the control station. Starting is by compressed

air in the usual manner, and ahead and astern cams are mounted side by side on the camshaft which is moved longitudinally by an air servo motor when it is desired to reverse the engine. The exhaust valves are water cooled and the valve levers are all pivoted eccentrically on a layshaft which

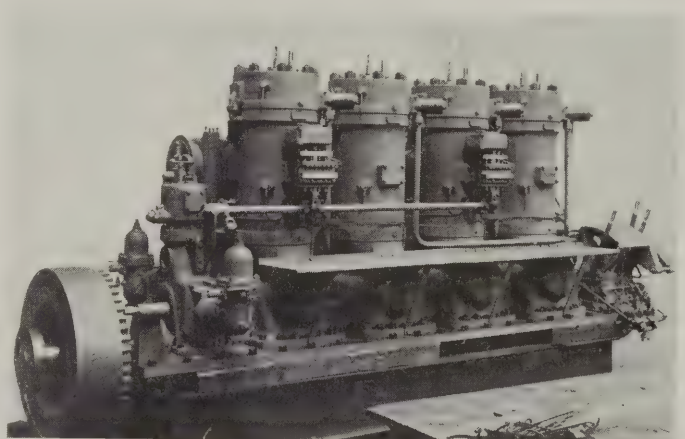


Valve Gear of One of the Cylinders of the New Vickers Engine

is turned before reversing, thus lifting the rollers of the valve levers off the cams before the camshaft is moved.

A NEW SULZER DESIGN

In the hope of lowering the cost of production, Sulzers have lately been engaged upon the development of an entirely new design of Diesel engine adapted mainly for low powers. At present, the motor is built only in sizes up to about 300 brake horsepower but there is the possibility of the same system being utilized for larger engines as the results have been



The New Sulzer Valveless Diesel Engine with Crank Chamber Compression

exceptionally good. In the engine illustrated, it will be noted that there is no air compressor and all valves are eliminated.

The motor operates on the two cycle principle and the smaller size has crank chamber compression for scavenging, although in bigger sets, separate pumps can be utilized, and this would, no doubt, prove more satisfactory. The fuel is delivered from a low pressure mechanical pump through an automatic atomizer into an ignition chamber in the cylinder cover. This injection takes place some time before the piston reaches the top dead center.

As the air is compressed on the upward stroke, it enters the ignition chamber through a comparatively small hole, connecting it with the combustion chamber. Partial ignition results, raising the pressure in the ignition chamber and this causes the whole of the fuel therein to be forced into the combustion chamber. The air mixes with the compressed

air and combustion takes place as in a normal Diesel motor. On the downward stroke, the exhaust gases are discharged through exhaust ports and scavenging air enters through ports at the bottom of the cylinder uncovered by the piston.

It is specially worthy of note that the fuel consumption of this engine is about 0.42 pound per brake horsepower hour when running on Diesel oil, a result almost equivalent to that of the best present-day Diesel engine of large power.

Insurance Companies Hard Hit by Japanese Disaster

Early Reports of Marine Losses Greatly Exaggerated—New York Marine Insurance Men Appoint Committee to Handle Japanese Problem

By "Bordereaux"

THERE are few prominent insurance companies in the world that will escape the payment of losses on account of the recent earthquake and fire in Japan. Companies are responsible for the effects of earthquakes and tidal waves, under their regular marine contract, as these are clearly so-called "acts of God." It is likely that a year or more will elapse before satisfactory proofs of loss can be presented to the respective insurers. There still remains a great deal of uncertainty as to the extent of the disaster, but it is generally felt, from the more recent advices received by underwriters, that early reports of marine losses were greatly exaggerated. Only two or three hulls were lost in Yokohama or along the coast; a large number of small craft were in the harbors and inside the breakwaters when the first earthquake shocks were felt and most of the loss incurred as respects hulls was on their account.

Modern massively constructed warehouses along the water front at Yokohama were controlled by Japanese customs officials, and in these the bulk of freight awaiting shipment, and discharged from vessels, is normally found. It is presumed that all records, governmental and private, kept in the Customs Compound have been destroyed. The exact location of any shipment will be a matter of uncertainty and may possibly never be determined beyond a shadow of doubt. Access to customs warehouses in Japan is denied to outsiders.

It is understood that the principal marine companies in Japan wrote large amounts for their own nationals and that those having branches in foreign countries were very active in shipments to and from the Japanese Empire. There are now more than forty companies of Japanese writing a general marine business. Cable advices to the *Nippu Ji Ji*, a Japanese newspaper in Honolulu, says the entire insurance losses in the earthquake zone will total about \$1,100,000,000. Of this sum eighty percent will be paid by the government and twenty percent by the insurance companies.

Steamers entering the Yokohama harbor are making extensive soundings because of the recent upheaval of the sea bottom. It is thought that it will be necessary eventually to make soundings for forty-five miles out, if the true condition of the bottom is to be known. For a considerable time after the earthquake Yokohama harbor remained inaccessible to vessels of the draft of those of the Canadian Pacific Line.

New York marine underwriters have been receiving requests from bankers and shippers that insurance policies or certificates of insurance be amended to cover to original port of destination or to any port in China or Japan to which goods may be diverted because of possible congestion at the intended port of discharge. This was the result of rumors reaching the United States of congestion in Japanese ports. Steamship lines are preparing to handle an abnormally large amount of freight and the Far Eastern Conference has met to discuss the situation brought about by the earthquake. A message has been received from Osaka to the effect that the Navy Department will soon be busily engaged

in scrapping a number of government vessels the material from which is to be used for reconstruction work at Tokio.

Most marine policies cover from warehouse to warehouse, and this doubtless means that the underwriters will sustain serious losses on cargo that was in transit at the time of the disaster. On the other hand, unless special provision was secured from the underwriters, goods delayed in local warehouses known as "godowns" will not be covered beyond a limited period. The earthquake clause is written in most of the policies in effect in Japan, and under it the underwriters are free of liability resulting from earthquakes. In general there is doubtless considerable merchandise still in warehouses in Japan under shore-end cover, and because of the general situation marine insurance men in New York recently met and appointed a special committee to handle the Japanese problem and to arrange to have competent salvage men on the ground as soon as possible.

Bonded Warehouse Pilferage

MARINE insurers are watching with interest and satisfaction the commendable enterprise that is being shown by the Merchants Association of New York, through its foreign trade bureau, in endeavoring to bring about a settled determination of the responsibilities for merchandise lost in bonded warehouses. The ordinary marine policy covers from warehouse and shipper to warehouse and consignee. However, if goods are placed in storage in a bonded warehouse, the marine insurance coverage would terminate, but, if the goods are held in such bonded warehouse for a temporary period and upon being delivered to consignee are found to have been pilfered, the question immediately arises as to where the pilferage occurred; that is, whether on the voyage or after the arrival of goods in the bonded warehouse. This is important to the underwriter because the pilferage bill would be put up to him.

Trade With Turkey

THE restoration of peaceful conditions in Turkey and quiet progress there toward the establishment of a republic are being watched by marine underwriters with great interest as indicating to them the probable revival of trade between that country and the United States. Hope is frankly expressed that, if such a revival should take place, improvement will be made in handling goods at the port of Constantinople. At present underwriters are confronted with heavy claims for damage on shipments to that port. This is particularly true as respects shipments of food stuffs, such as flour, sugar, etc. Apparently the goods are permitted to remain on lighters and in the open on shore for considerable periods exposed to the elements. This results in damage for which the underwriters have to be responsible. Insurers are also complaining that they do not receive fair treatment in connection with the adjustment of losses at Constantinople.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Weights of Fuel Oils

Q. (1,220).—Will you kindly furnish me with the weights per cubic foot or per gallon of the following oils for marine engines—gasolene, kerosene, oil for heavy oil engines, Diesel oil and marine boiler oil? N. L. S.

A. (1,220).—The following figures represent average conditions closely:

Oils	Cubic feet per ton	Gallons per ton	Pounds per cubic foot
Gasolene, boat	49	366.5	45.7
Gasolene, aviation	50	374.	44.8
Kerosene	44	329.1	50.9
Fuel oil (boiler)	40	299.2	56.
Diesel engine oil	42	314.	53.
Lubricating oil	38.5	288.	58.2

So-called heavy oil engines should use ordinary boiler fuel oil satisfactorily.

Diesel engines are capable of burning boiler fuel oil but this is generally unsatisfactory.

Fuel Consumption Problem

Q. (1,221).—A ship making 10 miles an hour makes 1,500 miles on 200 tons of coal. How much coal would be required for the ship to go 1,200 miles making 6 miles an hour?

A. (1,221).—At 10 miles the ship runs $\frac{1,500}{10} = 150$ hours on 200 tons.

This is then $\frac{200 \times 2,240}{150} = 2,990$ pounds per hour.

Assume a consumption of 2.5 pounds per horsepower per hour. Then the horsepower is about 1,200.

Assume a cargo ship 288 by 40 by 18.25 by 4,500 which would be reasonable for such a machinery installation. The power at 6 miles may be taken* at $\frac{1}{3}$ that at 10 miles, call it 400. The coal consumption at this power would be roughly 5 pounds per horsepower per hour. Hence she would consume per hour:

$5 \times 400 = 2,000$ pounds = 0.893 ton
1,200 miles at 6 miles requires 200 hours,
therefore tons of coal required are $200 \times 0.893 = 178.6$, say 180 tons.

*Propulsive coefficient taken as 85 percent that at 10 knots.

Comparative Fineness of Afterbody of Submarine and Destroyer

Q. (1,222).—Please compare the fineness of the after body of an ordinary submarine with that of destroyers or light cruisers.

A. (1,222).—It is somewhat difficult to convey a correct idea of the fineness of an under body without lines and curves of areas of section, which are, of course, impracticable to furnish.

A sufficiently accurate idea for your purpose may perhaps be obtained through the value of the prismatic coefficient of the after bodies in each case. The values of this coefficient in recent light cruisers and destroyers are about 0.63 to 0.64. For a modern submarine the corresponding figure is 0.54.

Effect of Jogging of Frames

Q. (1,223).—What can you say of the jogging of frames as to the effect on weight, strength, cost of construction, etc.?

A. (1,223).—The jogging of frames consists in the off-setting of the frame in way of outside strakes so that the frame bar lays against the inner surface of the strake. Jogging is done cold in a press before the frames are bent.

By jogging frames, liners are eliminated and their weight saved. This weight may amount to about $3\frac{1}{2}$ or 4 percent of the weight of the shell plating. Jogging may be done in frames or deck beams up to a depth of section of 12 inches. Jogged frames, however, are generally hand beveled and this is a disadvantage at the ends of a ship, if the framing is heavy, as the work of beveling becomes very laborious.

The strength of the shape is decreased by jogging but the loss is immaterial.

The advantage of jogging from the standpoint of cost lies in the saving in punching and riveting and in the reduction of the number of pieces to be handled. The actual amount of the saving will depend somewhat on the character of the vessel and the facilities of the shipyard.

Power Required to Drive Vessel

Q. (1,224).—Please tell me how much power I will require to drive a vessel 200 feet by 25 feet by 7 feet draft at a speed of 16 knots.

A. (1,224).—The writer has received similar questions to the above on a number of occasions and has been unable to give a satisfactory answer because the inquiries contained insufficient information. There should be furnished, in addition to that given above, the displacement and the prismatic, midship section or block coefficient. Otherwise no idea of the fineness of underbody or the displacement relative to the length is obtainable.

It is possible to have an infinite number of displacements on the same length and beam. For example, examine the following table:

	Length	Beam	Draft	Displ., Tons	Speed, Kts.	Eff. Hp.	Speed, Kts.	Eff. Hp.
Case 1	200	24	5.5	305	15	335	18	755
Case 2	200	24	6.6	406	15	480	18	980
Case 3	200	25.5	6.25	500	15	470	18	1,110

Cases 1 and 2 are for the same vessel at different drafts, while Case 3 is for a different vessel. Note that the displacement—length coefficient $\left(\frac{\text{displacement}}{\text{length}^3} \right)$

is 62.6 in Case 3 and but 38.1 in Case 1, while the block coefficients are 0.55 and 0.405 respectively. Note also that the effective horsepower at 15 knots is about the same for Cases 2 and 3 while for 18 knots Case 3 requires a good deal more power than Case 2.

The vessels referred to above are suited to relatively high speeds. The following is an instance of a vessel of similar

dimensions but of a very different type and intended for very low speeds:

	Length	Beam	Draft	Displ., Tons	Speed, Kts.	Eff. Hp.
Case 4	200	25	6.5	715	10	200

It would probably be impracticable to put sufficient power in a hull of this type to get a speed of even 15, to say nothing of 18, knots.

LETTER TO THE EDITORS

Combined Riveting and Welding

NORFOLK, Va.

TO THE EDITORS:

Referring to the editorial in your July issue and the letter of N. G. Near in the September issue under the above heading, the writer considers that the reinforcement of riveted joints by the use of metal arc welding would be good practice when it is necessary to increase the strength of existing riveted joints as in the case of the conversion of the battleship *Kearsarge* into a seagoing crane ship, on the other hand the use of metal arc welding to reinforce a riveted joint in new construction would, in general, indicate a lack of faith in both methods of joining metals.

The calculated maximum possible efficiency of any riveted joint is 89 percent as given in the specifications of the United States Navy, and experiments with riveted connections indicate that the loads at which riveted joints begin to open are very much lower than the ultimate strength of the joints.

A lap joint made by an electric arc welder, selected on the same basis as a first class riveter, will invariably fail outside of the joint, if a full fillet weld is made on both edges of the lap. Furthermore it is possible to reinforce both of these fillet welds, thus further insuring that the joint will not fail in the weld. With such assurance there appears no justification for weakening a lap joint by the use of rivets.

Tee, open butt strap, corner butt, and joggled lap (provided the fillet weld on the flush side is not made in the joggle) joints can also be depended on to give 100 percent efficiency, if the proper amount of filler metal is deposited in the weld. This assurance cannot be had for double-bevel or double-vee butt joints, without careful attention to many factors on which the strength of such joints depend, e.g., carbon content of the steel, sequence of welding, reinforcement of the weld, etc., and for this reason it would be better to avoid, at least for the present, the indiscriminate use of these joints in ship construction and repair. When such joints are used they should be reinforced by a strap.

The future application of welding to ship construction, to the exclusion of riveting, is contingent on a thorough knowledge of the factors on which the strength of the welded joint depends, and unless these factors are clearly understood, it will be quite possible to weaken a riveted joint by the use of welding. The writer believes the time will come when it will be thought as unnecessary to test a metal arc welded joint as it is now considered unnecessary to test a brick wall.

Relative to N. G. Near's desire for tests on combined riveted and welded joints, it is believed that such tests conducted by the Quasi Arc Company in England and those conducted by William T. Bonner during the war, the latter of which are given in the "Report of the United States Shipping Board of the Emergency Fleet Corporation on Electric Welding" by Captain James Caldwell, R. E., 1918, will give a clear indication of what can be expected of such a combination.

JAMES W. OWENS, Electrical Engineer, Norfolk Navy Yard. In charge of Welding Research for the Bureau of Construction and Repair of the United States Navy.

NEW BOOKS

The International Combustion Engine

THE INTERNATIONAL COMBUSTION ENGINE (Two volumes). By Harry R. Ricardo, B. A., A. M. I. C. E., M. I. A. E. Size 6½ by 9¾ inches. Volume I—Slow Speed Engines: Pages, 488. Illustrations, 215. Volume II—High Speed Engines: Pages, 373. Illustrations, 225. New York, 1923: D. Van Nostrand Company.

This work is built upon generous lines. The thermodynamics of the internal combustion engine is treated at length, and the application of the various types of engines to stationary practice, aeroplanes, motor cars and the multitudinous uses to which gas engines and similar motors are put is described in detail.

For the shipbuilder and those concerned with marine affairs, however, the book appears to us somewhat disappointing, as the development of the marine Diesel engine, up to the present time, has been greater and is now proceeding more rapidly than one is led to believe by a perusal of its pages. There is in the book no adequate treatment of the Diesel as it stands today in relation to marine development and, in a modern and up-to-date work, this appears a rather serious omission.

For the designer of internal combustion engines the book contains much of interest and should prove a valuable addition to his bookshelf.

Sir Alfred Yarrow

ALFRED YARROW; HIS LIFE AND WORK. Compiled by Eleanor C. Barnes (Lady Yarrow). Size, 5½ by 8¾ inches. Pages, 328. Illustrations, 83. New York, 1923; Longmans, Green and Company.

The name Yarrow is a household word among shipbuilders the world over. There is possibly no man who has attained a greater prominence in the field of marine engineering and its allied arts during the past twenty-five years than Sir Alfred Yarrow. And this enviable and deserved position is but the natural result of signal ability coupled with hard and conscientious work.

Entering the engineering profession as an apprentice at the age of fifteen, Yarrow's inventive and constructive genius carried him forward by leaps and bounds. His first serious invention was a steam plough, patented more than sixty years ago. This was followed by a steam carriage capable of making twenty-five miles an hour.

After that, he turned his attention to the sea, and in 1868 his first steam launch was delivered. From that time on Yarrow's work, as exemplified by his torpedo boats and destroyers, the Yarrow boiler, his development of the science of balancing reciprocating engines—all is well known to the members of his profession.

All this is interestingly recorded, if in a somewhat fragmentary manner, by Lady Yarrow in the biography under review. The book also gives another side to the picture, perhaps not so generally known—the life story of a kindly, lovable and public-spirited gentleman.

The History and Problems of the International Seamen's Union of America

The account of the organization and activities of the International Seamen's Union of America published by the Bureau of Labor Statistics of the United States Department of Labor as Bulletin No. 342 records the efforts of the union over a long period to change the laws of contract relating to seamen.

PERSONAL MENTION

T. S. ROSSBOTTOM has been appointed general manager of the United States Lines in charge of operations.

R. D. YAUCH has been appointed manager of the allocation department of the United States Shipping Board at Washington.

U. J. GENDRON has been appointed manager of the contract department of the Shipping Board with headquarters at Washington.

WILLIAM J. LOVE has resigned as general manager of the Emergency Fleet Corporation to accept the appointment of managing director of the United States Lines.

ALFRED WELLER, formerly assistant to M. A. Kerwin, traffic manager of the Colombia Steamship Company, has been made traffic manager of the company, succeeding Mr. Kerwin.

W. O. HAINES, who has been connected with Norton, Lilly and Company on the Pacific coast staff, has been appointed superintendent at Portland, Ore., for the company's Pacific port service.

CAPTAIN R. D. GATEWOOD, director of the Bureau of Maintenance and Repairs, United States Shipping Board, is in Europe inspecting facilities for the repair of Shipping Board vessels.

FRANK T. LORD of New York was recently named as one of Chairman Farley's aides in the United States Shipping Board. His title is assistant to the president of the Emergency Fleet Corporation.

J. B. SMULL, former president of the Emergency Fleet Corporation, is now actively participating in the business of J. H. Winchester and Company, ship brokers at 17 Battery Place, New York.

E. C. MORSE has joined the organization of the Triumph Electric Company and the Triumph Ice Machine Company, Cincinnati (Oakley), Ohio, as vice-president in charge of sales and member of the board of directors.

COL. R. H. HALLETT, formerly of the legal division of the United States Shipping Board, is now acting as assistant to Chairman Farley. Col. Hallett was at one time assistant director of the Bureau of War Risk Insurance.

F. S. B. HEWARD has joined the board of the Canadian Combustion Engineering Corporation, Ltd., representatives in Canada of James Howden and Company. Mr. Heward still retains his connection on the executive board of the latter company.

M. A. KERWIN, formerly traffic manager of the Colombia Steamship Company, has been appointed traffic manager of the Di Giorgio Fruit Corporation. In addition to this work he will also have charge of the freight and passenger vessels operated by Di Giorgio.

R. H. M. ROBINSON, president of the United American Lines, has severed his connection with the American-Hawaiian Lines, his place being filled on the board temporarily by V. H. Thun, treasurer of the company. A permanent director will be elected at the next meeting of the board to be held in San Francisco.

W. A. HARRIMAN has resigned as chairman of the board of directors of the American-Hawaiian Steamship Company, as a result of the separation of the affairs of the American-Hawaiian Line and the United American Lines, formerly under one management. Mr. Harriman will, however, continue as a member of the board of directors of the latter

company. The office of chairman of the board has been abolished.

A. P. VILLAIN, formerly with the passenger department of the Canadian Pacific, has been appointed district passenger agent of the United States Lines at San Francisco, succeeding Theodore H. Jacobs, who was recently made Pacific coast passenger manager of the United American Lines.

E. S. BOGART AND W. P. RUDROW have become associated with the United American Lines in the inter-coastal department. Mr. Bogart was formerly claims agent for the American-Hawaiian Steamship Company and will act in the same capacity for the United American Lines, while Mr. Rudrow, formerly general freight agent of the North Atlantic and Western Steamship Company, will be east-bound freight agent for the United American Lines.

SIR ALFRED YARROW, the noted British engineer and ship-builder who was a visitor in this country last month, pre-

facied his arrival with the interesting prediction that within twenty years all tramp steamers will be run by Diesel engines unless in the meantime some other invention is developed to supplant this method of propulsion. Although not a Diesel engine builder, Sir Alfred's opinions regarding this field of development command universal attention because of the accurate foresight which has characterized his exceptional career in the design and building of ships and propelling machinery. As early as 1868 Sir Alfred delivered his first steam launch to order.

Since that time his progress of achievement has been marked by milestones such as the day when a torpedo was first mounted on one of his fast launches, the first appearance of the Yarrow boiler, and so on down to the world war when Yarrow boats came into their own.

EDWARD P. FARLEY, chairman of the United States Shipping Board, sailed for Europe on the *Leviathan* on October 20 to make a complete survey of the foreign service of the United States Shipping Board and Emergency Fleet Corporation, located in northern Europe, and to attend the Transatlantic Passenger Conference to be held on November 7 in London. Mr. Farley will visit Great Britain and France and probably Germany, Belgium, Holland and Italy. He will return to the United States the last week in November.

GEORGE GORDON CRAWFORD, president of the Tennessee Coal, Iron and Railroad Company, has been appointed chairman of the dock commission to be in charge of the development of the port of Mobile, Ala., by Governor W. W. Brandon. The sum of \$10,000,000 has been voted for the development of the port of Mobile, and it is intended that the dock commission, headed by Mr. Crawford, will be charged with the organization of the forces to map out and carry on the development work.

CAPTAIN E. M. TROTT, traveling superintendent of the United States Lighthouse Department, with headquarters at Tompkinsville, Staten Island, died recently at West New Brighton, Staten Island. Captain Trott was fifty-three years old and had been in the lighthouse service for more than twenty-five years.



Sir Alfred Yarrow

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

Old Dominion and Southern Pacific Companies Place New Ship Contracts Costing Close to Five Millions

A CONTRACT for the construction of two passenger and freight ships for the Old Dominion Steamship Line has been awarded the Newport News Shipbuilding & Drydock Company, of Newport News, Va., according to official information obtained by MARINE ENGINEERING AND SHIPPING AGE. Semi-official confirmation has also been received of the report that the contract for the construction of a new ship for the Southern Pacific Company has been placed with the Tacoma, Washington, plant of the Todd Shipyards Corporation. It is estimated that the two contracts will involve an expenditure of close to \$5,000,000 and considerable interest attaches to the announcement as it follows on the heels of the placing of close to two and one-half million dollars' worth of new vessel construction by Standard Oil interests.

OLD DOMINION LINERS

The proposed Old Dominion ships are to be of the 3-deck, hurricane deck, coastwise type, 375 feet 6 inches in length by 53 feet beam and 29 feet 9 inches deep. Accommodations are to be provided for about 322 first class passengers, 58 steerage and 289 immigrants. The ships will have about 2,100 deadweight carrying capacity and will be propelled by Newport News Company Curtis turbine engines with Newport News single reduction gears turning single screws, steam being supplied by four Babcock & Wilcox watertube boilers, equipped with superheaters. The engines will develop about 4,750 shaft horsepower.

THE SOUTHERN PACIFIC SHIP

The estimates prepared for the Southern Pacific ship provided for a vessel having an overall length of 445 feet, 57 feet beam, depth to hurricane deck 37 feet 6 inches, draft 25 feet 6 inches, with a deadweight tonnage of 7,000. She is to be a single screw vessel, driven by double reduction geared turbines of 6,000 brake horsepower, steam being supplied by six oil burning watertube boilers at a pressure of 250 pounds. The ship is to be fitted to carry about 237 first class and 111 steerage passengers.

U. S. Cruiser Marblehead Successfully Launched at Philadelphia Yard

THE *Marblehead*, the fourth of five light cruisers built or now building at the plant of the Wm. Cramp & Sons Ship and Engine Building Company, in Philadelphia, was launched on October 9.

The hull is 555 feet 6 inches in length overall, 550 feet between perpendiculars and 55 feet in breadth at load waterline. With a designed speed greater than 35 knots, the vessel has a trial displacement of about 7,100 tons with a mean draft of 13 feet 6 inches. At full load the draft will be over 15 feet.

PROPELLING MACHINERY

Propulsion is by four propellers, each driven through reduction gearing by cross-compound Parsons turbines, and, in addition, geared cruising turbines are provided for additional economy at speeds of 20 knots and below. At maximum power the main turbines are capable of developing 100,000 shaft horsepower. Steam is supplied by 12 express type watertube boilers, burning oil fuel.

The main battery consists of twelve six-inch 53-caliber rapid fire guns. The secondary battery consists of two three-inch 50-caliber anti-air-craft guns and two three-pounders. Two triple and two twin above-water torpedo mounts are also provided.

Sun and New York Shipbuilding Companies Awarded Contract for Five and Three S. O. Diesel Oil Barges

THE Sun Shipbuilding Company, of Chester, Pa., and the New York Shipbuilding Company, of Camden, N. J., were the successful bidders for the construction of Diesel-engined oil barges, proposals for which were received by the Standard Transportation Company, a subsidiary of the Standard Oil Company, on Thursday, September 27. The Sun Company has been awarded the contract for five of the vessels and the New York shipbuilding plant, three. Although official figures were not given out, it is understood that the larger contract will involve close to \$1,500,000 and the other about \$900,000.

The new vessels are to be similar to those previously constructed by the Sun Company and according to specifications are to have a length overall of 260 feet, beam molded 40 feet, draft molded 14 feet, and constructed with nine oiltight bulkheads. Each vessel is to have a capacity of 13,500 fifty-gallon barrels of oil on a 12-foot draft.

The main propelling machinery will consist of two 300 brake horsepower, 6-cylinder, 4-cycle, direct reversible, air injection, Diesel oil engines, turning twin screws.

Word comes from the Union Shipbuilding Company, Baltimore, Md., of the company's reorganization of their Repair Department.

American Bridge Co. Gets \$269,250 19-Barge Contract

THE Chief of Engineers, Washington, D. C., has awarded to the American Bridge Company, Pittsburgh, Pa., a contract for the construction of 19 steel barges, 15 to be constructed with cargo boxes at a cost of \$215,250, and four without cargo boxes at \$54,000, involving a total of \$269,250.

The boats are for the District Engineer Office, Louisville, Ky., and are to have a length of 110 feet, beam 26 feet, depth 6½ feet. Bids for the work were opened at Louisville on September 11, the American Bridge Company being the low bidder.

Steamship Owners Urge Revision of Navigation Laws

PRESIDENT Alfred Gilbert Smith of the American Steamship Owners' Association has completed the selection of a special committee of practical ship managers and operators to prepare a thoroughgoing revision of the navigation laws and rules of the United States, including the La Follette Seamen's Act and the laws and rules of the Steamboat Inspection Service. This committee from the Ship-owners' Association will seek the active co-operation of the Department of Commerce and the Shipping Board.

The committee as selected by President Smith is as follows: Captain Eugene E. O'Donnell, manager of the marine department of C. H. Sprague & Son, of Boston, chairman; J. D. Tomlinson, vice-president of the American-Hawaiian Steamship Company; David T. Warden, manager of the marine department of the Tide Water Oil Company; A. J. McCarthy, manager of the American flag steamers of the International Mercantile Marine Company, and Robert F. Hand, assistant manager of the marine department of the Standard Oil Company of New Jersey.

Captain O'Donnell, Mr. Warden and Mr. Hand were among those who participated in the inquiry of the special committee created several years ago by the Shipping Board to make a study of the navigation laws and rules. This former committee included representatives of the seagoing officers and men, and was headed by P. A. S. Franklin, president of the International Mercantile Marine Company. Its work will be a foundation for the present inquiry. The purpose is to have definite recommendations in hand in time for consideration at the coming session of Congress.

Great Lakes Engineering Works to Build One of Ford Ships

THE Great Lakes Engineering Works, River Rouge, Mich., has been awarded the contract for one freight ship for the Ford Motor Company, of Detroit, Mich., according to official information received by MARINE ENGINEERING AND SHIPPING AGE. It is understood that the proposed vessel will have an overall length of 611 feet and be propelled by Diesel engines. Bids for the hulls were taken recently and it is reported that the contract for the second ship has been placed with the American Shipbuilding Company.

Details regarding the construction of the vessels and their equipment have been withheld by the Ford Company.

New Steamer is Under Consideration By Matson Line

ACCORDING to a recent statement by E. D. Tenney, president of the Matson Line of San Francisco, the construction of a new liner with speed enough to make the run from San Francisco to Honolulu in four and a half days is being considered by the officials of the company. The fastest of the company's liners now makes the trip in five days, twenty-two hours.

New Contracts

SEVERN and a half million dollars worth of new vessel construction, a large portion of which has been listed as "pending" for many weeks, has been placed and the maritime industry looks ahead with renewed courage. One of the outstanding features of the awarding of contracts for eleven ships, eight for the Standard Oil Company, two for the Old Dominion Steamship Line and one for the Southern Pacific Company, is the significance attending the building of the oil boats.

Businessmen point out that when the downward trend of affairs is apparently at its worst and the outlook is the blackest, the Standard Oil interests come into the market and buy. For this great purchaser to order, at this time, eight Diesel-propelled, seagoing carriers is taken as an indication that prices are not going lower and NOW is the time to place new contracts.

With these three companies, representative of the nation's leading financial leaders, coming into the marine market at present augurs well for the future of American shipping. Further, the placing of this new constructive work in four different shipyards in different parts of the country sounds a cheering note for the employment of heretofore idle hands—and is not without its bright side for equipment manufacturers.

There are other contracts still under contemplation. If the events of last month are a criterion, and if any faith can be pinned to the judgement and foresight of our big business men, additional contract awards are coming in the not far distant future.

Survey Reports 356 Shipping Board Vessels Available for Conversion to Diesel Ships; Repair Needs Shown

CHAIRMAN FARLEY of the Shipping Board has made public the report of the Board's Fleet Survey Committee, composed of Commissioners O'Connor, Chairman, and Commissioners Benson and Plummer. This Committee has been working for months to obtain the data upon which the report is based, and it covers a complete record of the laid-up fleet, and also divides the fleet into various qualifications as to type, condition, and economy of operation. The following sub-divisions have been made:

SURVEY RESULTS

Class A. 427 steel vessels. Composed of steel of good design, well built, with reliable machinery and deck auxiliaries, capable of continuous operation with normal up-keep. Not requiring in excess of \$35,000 for repairs.

Class B. 177 steel vessels. Of the same as Class A, but requiring repairs and overhauling in excess of \$35,000 each. This expenditure would allow either a greater amount of repairs and overhauling on the replacement of faulty deck or engine room auxiliaries or renewals of gears, etc., which would bring them in Class A.

Class C. 84 steel vessels. Good type and well built hulls in fair state of preservation, but less desirable than A and B, by reason

of unreliable and uneconomical machinery, which, however, could be replaced with reliable and economical equipment at cost of not to exceed \$100,000 per ship.

Class D. 356 steel vessels. Includes vessels of good design and competitive type but fitted with machinery that will require extensive renewal in varying degree, and are desirable hulls for conversion to Diesel propulsion.

Class E. 175 steel vessels. Vessels not considered suitable for American-flag operation.

Class F. 40 vessels. Obsolete types and too old to be rejuvenated or too badly damaged to be serviceable.

SPECIAL TYPE

Army Transports—5. Considered competitive units and in good condition.

Passenger vessels—33. Including 535's, 500's and ex-enemy vessels, 30 of which are in spot condition with 3 laid up and being considered for reconditioning.

Tugs—35. Steel ocean-going, coal and oil burners; wood ocean-going, oil burners and harbor tugs. 6 in operation—9 laid up but in fair physical condition.

In addition to the above there are 362 ships in operation. These vessels have not been individually surveyed, as they are in good operative condition.

Bids Open Nov. 5 at Nashville for 90-Foot Snagboat

SEALD proposals will be received until November 5, by the United States Engineer Office, Nashville, Tenn., for one steel snagboat hull. The boat is to have a length molded of 90 feet, breadth molded 25 feet, depth molded at sides 3 feet 6 inches. The "A" frame will be about 30 feet long and there is to be one upright hand capstan of approved make, having a barrel 9½ inches in diameter over whelps.

The boat is to be delivered afloat at Fox Bluff, Tenn.

Shipping Board Turns Money Into Treasury

Chairman Farley of the United States Shipping Board has made public a letter to the Secretary of the Treasury showing that the Emergency Fleet Corporation had transferred to the general fund of the Treasury over \$37,000,000 as the result of liquidation of the board's war-time activities.

The above amount, together with \$61,808,729.48 deposited to the credit of the "Construction Loan Fund" as directed by Congress, makes a grand total of \$99,435,312.71, which has been deposited in the Treasury during the past two years.

City of Philadelphia to Vote on Issue of \$8,923,000 for Carrying on Extensive Port Expansion Plan

ON November 6, 1923, the city of Philadelphia will vote on a loan, the marine content of which provides for a total of \$8,923,000 worth of port work. It is also understood that provisions are being made for the construction of six mud scows, at an estimated total cost of \$120,000, the pier and boat work to be carried on by the Department of Wharves, Docks and Ferries, of which George F. Sproule is the Director. Among the items of port work are the following:

Toward the acquisition of real estate for the approaches to and erection and construction of the approaches and superstructure of

the Delaware River bridge, \$5,623,000; toward the acquisition of real estate and real estate easements, and for the erection, construction, improvement and equipment of wharves, docks, bulkheads and the work appurtenant and adjacent thereto, \$2,000,000; toward the cost of acquiring land for approaches to and the erection and construction of approaches and superstructure of the Delaware River bridge, \$800,000; for the erection and construction of bridges, \$500,000.

Funds will also probably be used toward the completion of Piers 82 and 84 South, foot of Wolf and Porter streets, Delaware River.

Twenty Steel Barges and Two Double Dipper Dredges Proposed by Engineer Office, Louisville, Ky.

THE construction of twenty steel barges, at an estimated cost of approximately \$300,000, is planned by the United States Engineer Office, P. O. Box 72, Louisville, Ky. Plans and specifications are now being completed.

It is understood that two of the boats (Lot A) will have a length of 120 feet, beam 36 feet, depth 7 feet 6 inches; two (Lot B) will have a length of 100 feet, beam 25 feet and depth 5 feet; and sixteen (Lot C) are to have a length of 110 feet, beam 26 feet, depth 6 feet 6 inches. Fourteen of the boats under Lot C are to be constructed with cargo boxes.

TWO STEEL DREDGES

The same office expects to ask, in the near future, for bids for furnishing and delivering machinery and plans for two steel

dredges. A complete description of the dredge machinery and plans, including dimension of machinery, size and boilers, gear, etc., together with drawings to show the layout, method of operation, and the hull of the proposed dredges, will be asked for.

The dredges are to be steam operated, equipped with a Scotch marine type boiler with water back and designed for a working pressure of at least 125 pounds. The vessels are to be capable of dredging compacted gravel, the machinery to be designed for a 4-yard dipper in hard gravel and a 2½-yard dipper in rock. Each dredge will be equipped with two dippers, one for rock and one for sand and gravel.

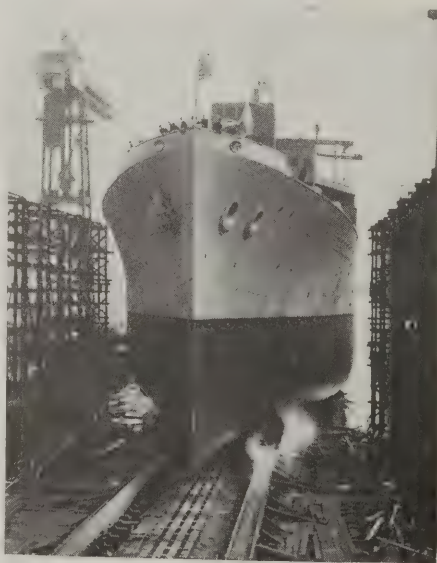
The dredges should draw not over 4 feet, when completely outfitted and loaded with 30 tons of coal.

Towboat and Barges Planned by Western Barge Line

It is reported from Omaha, Nebraska, that the Western Barge Line, a newly organized company of that city, plans the construction of one towboat and four to six barges to operate on the Missouri River. The tug is to have an overall length of about 108 feet, beam 24 feet, depth 3½ feet, and is to have a 15-foot stern wheel. The barges will have a draft of 6 inches light and 30 inches loaded.

Gas Manufacturers to Co-operate with Welding Schools

The Gas Products Association, 140 S. Dearborn street, Chicago, Ill., recently appointed an educational committee to co-operate with trade and technical schools all over the country in supplying a practical and standard course in welding procedure. The committee will endeavor to build up a list of accredited schools which are known to give a standard instruction, and whose students can be depended upon to qualify as satisfactory welding operators. It is proposed to make this educational movement effective all over the country.



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Launching the Fuel Ship Whitney at the
Boston Navy Yard. The Vessel
Will Cost About \$8,000,000

World's Shipbuilding Reaches Low Level

WORLD construction at the close of quarter just ended was smaller than at any time since the close of the war, Lloyd's Register states, and this represents a decline of more than 165,000 gross tons in comparison with the preceding quarter, ending June 30, last. In the past three months the aggregate of American construction decreased 34,000 tons, that for Great Britain and Ireland, 66,000 tons, and for all other countries combined 65,000 tons.

The following table shows in gross tons the comparison of construction orders now, as compared with three months ago:

	October 1	July 1
Great Britain and Ireland.	1,271,195	1,337,759
United States.....	99,383	133,660
Other countries.....	1,007,119	1,072,437
World total.....	2,377,697	2,543,856

If only construction on which work is actually proceeding is taken into consideration, however, Lloyd's Register points out, the present aggregate is 229,000 tons less than three months ago. Contracts on which work has been suspended in Great Britain and Ireland now represent 242,000 tons, as against 83,000 tons for all other countries. The actual construction now under way, therefore, compares with that of the previous quarter as follows, the figures representing gross tons:

	October 1	July 1
Great Britain and Ireland.	1,029,195	1,207,759
Other countries.....	1,023,502	1,074,097
World total.....	2,052,697	2,281,856

It will be seen, therefore, says Lloyd's Register, that while the actual work in British shipyards has decreased more than 175,000 tons since July 1, that in all other countries taken together has fallen off only 50,000 tons. As a result, British plants, which three months ago were constructing 133,000 tons more than all the rest of the world combined, are now building only about 5,000 tons more.

Idle French Shipping Decreases

A STEADY decline in the number of idle French ships reported in the first half of 1923 is reported by the *Journal de la Marine Marchande* of August 16, forwarded the Department of Commerce by Commercial Attache C. L. Jones. Idle French tonnage as of January 15, April 15, and July 15, 1923, is shown in the following table:

Date	Number	Tonnage	Percent of total
Jan. 15.....	530	845,255	23
April 15.....	450	796,247	21
July 15.....	409	561,382	18

The figures for July 15, compared with those of April 15, show a decrease of 14 percent in the number of idle ships and of 17 percent in idle tonnage. The total idle tonnage on July 15 constituted 18 percent of all the French merchant marine.

Cannery Buys Shipyard

Word comes from Seattle that the wooden shipbuilding plant at Houghton Lake, Washington, originally known as the Anderson Yard, has been purchased by the Alaska Consolidated Canneries from the Lake Union Drydock and Machine Works. The new owners will continue the yard in commercial business.

First American-Built Doxford Diesel Proves Its Value in the Miller County

THE *Miller County*, an 11,000-ton dead-weight oil tanker owned by the Sun Shipbuilding Company, one of three sister ships equipped with engines of the Doxford two-cycle, four-cylinder opposed piston type built by the Sun yard, arrived in New York Harbor September 27 after a practically perfect run from Tampico with a cargo of Mexican crude oil for the Warner-Quinlan Company at Carteret, N. J. The Doxford engine in this ship is the first to be built in this country and has proven satisfactory in every way for the entire 15,000 miles which the ship has made since she was changed from a turbine drive.

VESSEL BOUGHT FROM SHIPPING BOARD

The hulls for the three ships, the *Miller County*, *Bidwell* and *Challenger*, were bought from the United States Shipping Board and converted by the Sun Shipbuilding Company plant, Chester, Pa. The *Miller County* is about 460 feet overall length, 60 feet beam and 27½ feet draft with a dead-weight of 11,000 tons at this draft. Her main engine is of 3,000 indicated horsepower driving a single screw. One Scotch boiler was retained from the former installation to supply the auxiliaries which are all steam operated, as well as for the tank heating coils. The engine complete, including the thrust shaft and fly wheel, weighs approximately 370 tons.

PERFORMANCE OF THE ENGINE

On her voyage from Tampico the engine developed 2,820 indicated horsepower at 71.1 revolutions per minute with a fuel consumption of 0.344 pound of oil per indicated horsepower per hour. Each cylinder developed exactly 705 indicated horsepower for the trip, the exhaust temperature averaged 630 degrees F. With a fuel pressure of 8,000 pounds, her average speed was about 11 knots. On the 2,030 miles run the total fuel consumption was 72 barrels of Texas crude oil. With Diesel oil of 23 degrees Beaumé better fuel economy is expected.

The performance of the Diesel engine in this ship is strikingly brought out by the fact that the single boiler supplying the auxiliaries consumed nearly as much fuel during the voyage as the main engine.

The second ship to be equipped with a Sun-built Doxford engine has steam driven auxiliaries also, but the *Challenger*, the third of the class, will be fitted with electric-driven auxiliaries throughout.

Navigation School Reopened at Seattle

According to announcement from Seattle, Wash., the University of Washington has announced that as a part of its extension service program it will reopen the Navigation School at the University Observatory. The school was conducted during the war by the United States Shipping Board, but its activities were discontinued two years ago when the Shipping Board withdrew from the enterprise because of lack of funds.

Shipping Board Awards Fuel Oil Contract

As the result of competitive bids opened October 1 for furnishing 1,065,000 barrels of fuel oil to the Shipping Board per month for the calendar year 1924, the contract has been awarded to the Standard Oil Company of New Jersey.



Motorship *Suphenco*, of 5,350 Tons Deadweight Capacity, Operated by the Transmarine Lines

Car Ferry *George H. Walker* Goes Into Service

THE Gulf Coast Lines have put in service at Baton Rouge, La., a new transfer steamer, the *George H. Walker*, to ferry its trains across the Mississippi river.

The new boat is of steel, 340 feet long, 91 feet 6 inches wide with a molded depth of 11 feet. It was built by the Dravo Contracting Company, Pittsburgh, Pa., and cost over \$250,000. It has three tracks and can carry 12 passenger cars or 21 freight cars.

The boat is propelled by independently operated side wheels driven by two engines each developing about 600 horsepower from boilers carrying 200 pounds steam pressure.

New Hudson River Day Line Boat Launched

The excursion steamer *Alexander Hamilton* built by Bethlehem Ship Building Company at Sparrows Point for the Hudson River Day Line, was launched October 20. The completed vessel will cost \$1,000,000.

The new boat is 348 feet in length, 77 feet beam and 13 feet deep. She has a capacity of 4,000 persons.

The vessel will be equipped with four Scotch oil-burner boilers, and she will be capable of making slightly over twenty-one knots.

Steel Tug Contract Goes to Howard Shipyards

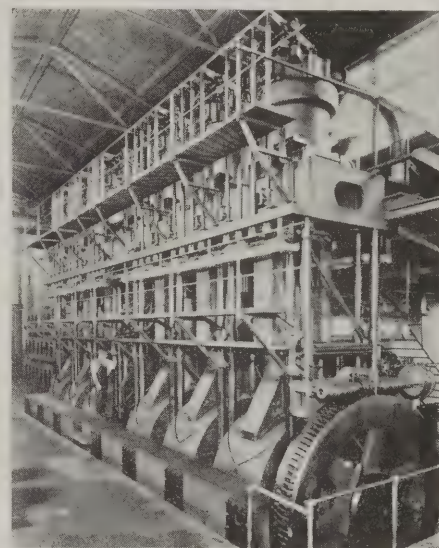
The American Steel & Wire Company has awarded a contract for a \$150,000 steel tow-boat to the Howard Shipyards, Jeffersonville, Ind. The boat is to have a length of 165 feet, 32 feet beam and 6 feet draft. She will be equipped with compound condensing engines, having a 7-foot stroke.

New Dry Dock in Tampico

One of the important building propositions now being developed in Mexico is the dry dock in Tampico which will be the largest on the east side of America from Galveston to Panama. This dry dock will be built at Buckley Island on the Panuco River and as a part of the project shops and shipyards will be erected.

Transmarine Motorship Completes Maiden Voyage

WITH the arrival of the M. S. *Suphenco* at Port Newark, N. J., on October 9, the first Transmarine motorship, completed its maiden voyage to the Gulf cities of Pensacola and Port Arthur and return. This voyage, totaling over 5,000 nautical miles, afforded ample opportunity



The *Suphenco's* 1,800 Horsepower Diesel Engine

to show the merits of the vessel's Diesel engine. Averaging a little better than 10 knots, the *Suphenco* consumed 4½ tons of fuel oil a day. The fuel oil carried by the *Suphenco* permits a cruising radius of 38,000 miles.

The engine is a 6-cylinder, 4-cycle cross head Craig-Diesel having a 30-inch bore and 4-foot stroke, operating at a maximum of 100 revolutions per minute. The main bearings, crank shaft and piston are water cooled.

One of the features of the engine is the elimination of the customary air compressor attached to the main crank shaft. The fuel air is injected by compressor as usual but this is supplied by an auxiliary unit. All deck machinery, winches, windlass, steering gear together with engine room pumps and auxiliaries are operated by electricity with specially designed marine Elco motors.

Foreign Shipping and Shipbuilding Activities

Italian Line Orders Three Steamers

THE Societa in Azioni Navigazione Libera-Trientina, of Trieste, has placed an order with a local shipyard for three steamers. The company already owns twenty-eight vessels, all engaged in the ocean tramp trade and ranging from the *Rosandra* (7,756 tons gross) to the motorship *Sesta* of 107 tons gross. It is understood that the new vessels will be of the *Laguna* (5,400 tons gross) type.

Canadian Yards Inactive

ADVICES from Ottawa state that business is dull in Canadian shipping and shipbuilding circles. On July 31 there were 132 more vessels of all kinds on the Canadian register than there were at the end of 1922, still the net tonnage was about 69,000 tons less. Quite a few boats are being built, but these are being offset by removals, the latter being so well looked after that there is now but little, if any, deadwood on the register.

Montrose Yard to Build Passenger Steamer

AN order has just been placed with the Coaster Construction Company, Ltd., Montrose, for a passenger day service steamer for the Union Steamship Company of British Columbia. This will be easily the largest vessel ever built in Montrose, as she is to be 236 feet over all and 40 feet in breadth. The steamer will be handsomely fitted up with a large dining saloon capable of being used as a dancing saloon, a large lounge, staterooms, smoking room, etc. Space will be reserved forward for the carriage of a certain amount of general cargo. The vessel will be completed early next year.

Steamship Voltaire Completed

The new Lamport & Holt liner *Voltaire*, built for service between New York and South America, will leave Liverpool on her trial trip November 15.



Launching of the 8,000-Ton French Cruiser Duguay-Trouin at Brest Dockyards on August 14. Her Engines Will Develop 110,000 Horsepower

Wreck of Fourth French Steamer Starts Investigation—Naval Building Program

By Our Paris Correspondent

THE principal event in connection with French shipping which has taken place in the last month is the wreck of the cargo steamer *Depute-Emile-Driant*, belonging to the steamship company Les Armateurs Français, which capsized on August 30 when she was proceeding from Newcastle-on-Tyne to Rouen with an important cargo of coal. That vessel belonged to the series of the *Marie-Louise*, also known in this country under the name of the series of the *Deputes*, three of which have already been wrecked within two years.

The vessels of that type belonged to the State merchant fleet which was liquidated in 1922: the first vessel of the series, the *Marie-Louise*, which was owned by a private firm, was taken as a model by the Department of Merchant Marine when the Government de-

cided during the war to build merchant ships. The vessels were built by naval dockyards under the supervision of naval architects of the Admiralty. It is pointed out that various alterations in the original design were brought about by the latter, and it is hinted that any imperfections in the ships might have been caused by those alterations.

EXPERTS INVESTIGATE SEAWORTHINESS OF THE VESSELS

The three other vessels of the series which have been wrecked are the *Depute-Raoul-Briquet*, the *Depute-Gaston-Dumesnil* and the *Depute-Albert-Taillandier*. Following the wrecks of these three vessels, the Under Secretary of State for Mercantile Marine appointed in 1922 a committee of experts with a view to making a careful examination on the seaworthiness of the vessels of that type. The experts stated that the seaworthiness of these ships was reliable provided that some alterations were made in order to minimize the chances of the recurrence of such disasters.

The chief feature of the construction of these ships lies in the existence of lateral tanks situated in the upper part of the hull. The committee recommended that henceforth these tanks should not be filled. Apart from that particularity, it is now ascertained that these vessels have an abnormal aptitude to rolling and that the exaggerated rolling in a rough sea involves a considerable displacement of the cargo in the holds which results in the capsizing of the ships.

The four vessels were wrecked under similar conditions, without any professional fault having been committed by the shipmaster, and it is now certain that an imperfection in the construction which has still to be ascertained has been the cause of the four



French Destroyer Ensigne Gabolde

On her official six-hour trial this vessel, built by Chantiers & Ateliers Augustin Normand at Havre, made an average speed of 33.45 knots or 2.5 knots more than her contract speed.

successive wrecks which entailed the loss of 45 lives. The Under Secretary of State for Mercantile Marine has just appointed a new committee of experts who have been entrusted with the task of settling definitely the question of the seaworthiness of the vessels.

CRITICISM AROUSED

The keenest emotion has been felt in the whole country as a result of the new disaster, and there is much speculation in respect to the conclusions of the experts. It is noteworthy that eleven vessels of the same type are still in service in this country. Many papers have echoed the general feeling and the criticism expressed against the Under Secretary of State for Mercantile Marine, and the naval architects who drew up the plans of the ships, and they have requested that the eleven ships still in service be at once laid up in order to avoid the recurrence of such disasters, pending the decisions to be arrived at by the experts.

The principal dimensions of the vessels of the *Marie-Louise* type are: Length, 266 feet 8 inches; breadth, 39 feet 4 inches; depth, 22 feet 11 inches; gross tonnage, 2,310 tons.

NAVAL SHIPBUILDING PROGRAM

Considerable interest has been aroused in connection with the launching of the new cruiser *Duguay Trouin*, which took place at Brest on August 14 last. This is the first cruiser launched in France since the war. The *Duguay Trouin* belongs to the naval building program which was ratified by Parliament in 1921. Two other cruisers are under construction, also in naval dockyards: these are the *Primauguet* and the *Lamotte-Picquet*. The three cruisers are to be completed in 1925.

Private shipyards are also concerned in the construction of these warships, and it is noteworthy that the orders placed by the Department of Navy have much improved the position of some shipbuilders. The propelling machinery of the three cruisers is to be supplied by three private shipyards (Chantiers de Saint-Nazaire-Penhoet, Chantiers de la Loire and Forges et Chantiers de la Méditerranée). It will consist of turbines of the Parsons type developing a total of 110,000 horsepower. The cruisers, which will be quadruple-screw ships, are to maintain a service speed of 33 knots.

In addition to these three cruisers, the Department of Navy placed some months ago important orders with private firms in connection with the construction of 4 destroyers, 12 torpedo-boats and 12 submarines. All these warships are to be delivered in 1925.

CONVERSION OF THE FRANCE TO AN OIL BURNER

The French Line is making preliminary arrangements for the conversion of the liner *France* to an oil burner which is to be completed at Saint-Nazaire by the Chantiers et Ateliers de Saint-Nazaire-Penhoet on May 4, 1924. A general overhaul of the boilers of the liner will be carried out together with the transformation work. One hundred and twelve new combustion chambers which have been supplied by the Chantiers de la Seine Maritime are to replace the old ones.

For the execution of this work, the total cost of which will exceed 10 million francs, the Chantiers de Saint-Nazaire-Penhoet have requested the assistance of several other shipyards of Saint-Nazaire. The oil burning plant is to be supplied by the Wallsend Slipway Engineering Company on the Wallsend-Howden system which has already been installed on the *Paris* and several other ships of the French Line, as well as on most of the French oil burners.

Following her reconditioning, the *France*

will be capable of maintaining a service speed of 21.5 knots. She will sail from Havre on her first voyage as an oil burner on May 10. It will be remembered that the *France* was built in 1912 by the Chantiers de Saint-Nazaire-Penhoet. She is 689 feet 2 inches long, 75 feet 6 inches beam and 48 feet 5 inches deep; her displacement (loaded) is 27,192 tons, her gross tonnage 23,666 tons. The propelling machinery consists of 4 steam turbines each driving one propeller shaft. The total power developed is 42,000 horsepower. Steam is supplied by 19 boilers.

Two Large Steamers for Canadian Pacific Coastwise Fleet Planned

E. W. Beatty, K.C., president of the Canadian Pacific Railway, recently addressed a meeting of the Vancouver board of trade and announced that his company proposes to add two large modern steamers to its coast fleet, immediately, to take care of increasing tourist traffic. He also announced the early completion of a new pier at the harbor to cost several millions of dollars.

TRADE PUBLICATIONS

BUYING RUST PROTECTION.—The Eagle-Picher Lead Company, Chicago, Ill., has prepared a booklet on selecting a rust-proof paint and the features which determine its economy. Data on this subject is of valuable assistance in the selection of efficient, labor-saving economical paint for metal protective surfaces. In addition to taking up the cost of painting new surfaces, it also gives information on the preparation and re-painting of surfaces with sublimed blue lead.

WELDING CABLE.—Two announcements by the Rome Wire Company, Rome, N. Y., have been published describing special extra flexible electric welding cable and special-service cord. Many applications of these two types of cord, the first for welding outfits and the second for a variety of shop and household uses, are outlined.

SWITCHBOARD INSTRUMENTS.—Bulletin No. 450 of the Roller-Smith Company, 233 Broadway, New York, deals with alternating current switchboard instruments, including ammeters, voltmeters, single phase and polyphase wattmeters, frequency meters, power factor meters, synchroscopes, ground detectors, transformers, etc. Illustrations and specifications of each instrument are given together with a price list.

INDICATING AND RECORDING CO₂ METERS.—The Brown Instrument Company, Philadelphia, Pa., has sent out catalogue No. 30 describing electrical meters for the measurement of CO₂ content and temperature of flue gases. The efficient combustion of fuel requires an accurate knowledge of the combustion products. The meters designed by the Brown Instrument Company, it is stated, have been found satisfactory in meeting the demands of industrial operation. The principles of operation and maintenance of this equipment are included in the catalogue.

POLYPHASE INDUCTION MOTORS.—Motors of rugged construction and reliable in operation to meet severe requirements of land and sea service have been developed by the Burke Electric Company, Erie, Pa., and details of these polyphase induction motors are given in a bulletin recently sent out by the company. It is stated that these motors have been applied in practically every indus-

try in which electric drive has been adopted and are arranged for side wall or ceiling suspension and furnished with vertical or back gears to meet special requirements.

MECHANICAL OIL BURNING SYSTEMS.—The low pressure mechanical oil burning system, known as the Scarab-Coen has been described in a catalogue prepared by the Scarab Oil Burning Company, Ltd., Carlton House, Regent Street, London, England. This system has been fitted to over 1,000 installations of which the marine section exceeds a tonnage of over four and a half million ships. The company recommends this booklet to those interested in the question of economic steam production.

ELECTRIC RADIATORS.—The electro-vapour radiators put on the market by Walter Kidde and Company, New York city, are explained in a booklet now being distributed. This radiator gives by the turn of a switch the same heat electrically as the usual steam or hot water radiator and can be adapted to any installation where the usual cast iron radiator is installed.

FLOOR AND BENCH GRINDERS.—The two-wheel floor and bench grinders, manufactured by the Hisey-Wolf Machine Company, Cincinnati, O., are illustrated and described in detail in a new bulletin prepared by the company. Floor stand grinders are made in seven sizes ranging from ½ to 10 horsepower capacity, while the bench grinders are in two sizes of ½ and 1 horsepower capacity. The special features of these grinders are outlined with specifications and other details.

DIESEL YACHTS.—Cox & Stevens, New York city, has sent out a pamphlet which was recently prepared on the use of Diesel engines in yachts. The effect that this type of engine has on yacht design is fully discussed. This firm has designed a number of highly successful Diesel yachts, some of which have been built in this country and others abroad. A number of special type yachts are described in more or less detail and illustrations given of the completed designs. The book contains valuable information on the subject of Diesel engines in general and some interesting comparisons between what can be accomplished in cruising yachts powered with Diesel engines and those fitted with other types of machinery in connection with accommodations, cruising radius and cost of operation.

WELDING AND CUTTING EQUIPMENT.—The Torch Weld Equipment Company, Chicago, Ill., has issued a new catalogue covering its complete line of oxy-acetylene welding and cutting apparatus, lead welding, soldering, brazing, decarbonizing units, gas pressure regulators, automatic machines, generators and supplies. The catalogue contains cross sectional views of equipment with detailed explanations.

Business Note

Walter Kidde & Company, Inc., 140 Cedar street, New York, announce that the Lux System is now exclusively manufactured and sold by them in the United States of America. With the Lux System a container storing fifty pounds of carbon dioxide under pressure can be released in forty seconds depositing carbon dioxide "snow" at a temperature of less than -100 degrees F. upon the fire thereby cooling the charred mass in addition to extinguishing the fire by smothering it. The Lux System may be combined with the Rich System of smoke detection, using the same piping, thereby affording a fire detecting and extinguishing equipment for closed compartments.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPBUILDING AND REPAIRS

Repairs, Philadelphia, Pa.—The steamship G. A. Flagg is undergoing repairs at Cramp's shipyard.

Engine Repairs, Seattle, Wash.—Repairs were made on the engine of the steamship Queen recently.

Wood Steamer Repairs, Norfolk, Va.—The wooden steamer Mendora has been towed from Baltimore to Norfolk for repairs.

Spudding Engines, Nashville, Tenn.—U. S. Engineer Office, Customhouse, Nashville, Tenn., is in the market for two spudding engines.

British Steamer Repairs, Seattle, Wash.—As a result of grounding the British steamer Sunland has been drydocked at Seattle, Wash.

Repairs, San Francisco, Cal.—Smith & Scanlon were low bidders at the opening of tenders, recently, for repairs on the Pacific Mail liner Newport.

Steamer Drydocked, Portland, Ore.—The steamer Astorian, one of the river fleet which has been sold to be taken to Puget Sound, has been drydocked for repairs.

Steamer Painting, etc., Portland, Ore.—The steamer West Keats, of the Columbia-Pacific Shipping Company, has been drydocked for cleaning and painting.

Docking and Repairs, Baltimore, Md.—The United States Coast Guard cutter Comanche has been taken to the yard of the Maryland Drydock Company for docking and repairs.

Complete Overhauling, Savannah, Ga.—The Savannah liner City of Montgomery has been taken to the wharf of Rourke's Iron Works for extensive repairs and overhauling.

Pump Repairs, Jacksonville, Fla.—The steamer Allaguash, of the Foreign Transport & Mercantile Line, has been taken to Jacksonville for repairs to her circulation pump.

Cleaning and Painting, Portland, Ore.—The schooner North Bend has been lifted on drydock at Portland for cleaning and painting. The Oregon Pine is also on the drydock.

Propeller Installation, San Francisco, Cal.—The new Electra Line steamer Cuba went to the Bethlehem Shipbuilding Corporation's yard for the installation of a new propeller blade.

Conversion Work, Whitehaven, Md.—After having been a Chesapeake Bay freighter for 51 years, the schooner Eugie has been taken to the Whitehaven shipyard, Maryland, to be rebuilt.

Tanker Drydocked, Chester, Pa.—The Atlantic Refining Company's tanker Frances E. Powell has been drydocked at the Sun Shipbuilding and Drydock Company's yard, Chester, for miscellaneous repairs.

Completion of Repairs, Los Angeles, Cal.—The Los Angeles Shipyard has completed repairs on the Shipping Board tanker Hoven, chartered to Walker & Daly, the damage cost being approximately \$30,000.

Vessel Repairs, Los Angeles, Cal.—The tank steamer Hampton Roads, operated by Struthers & Barry, has been placed on the ways of the Los Angeles shipyard for repairs due to recent collision.

Bid Openings, San Francisco, Cal.—Bids have been taken for repairs and other work to the Pacific Mail steamers San Juan and Ecuador, and also for repairs to the French liner Montana, recently damaged in collision.

Spud Gallows Bids, Jacksonville, Fla.—The W. G. Brennan Company, Jacksonville, Fla., was low bidder at \$1,200 for a spud gallows frame for the dredge Mallory, of the U. S. Engineer Office, Jacksonville, Fla.

Low Bidder, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was low bidder for covering miscellaneous repairs on the Panama steamer Ida of W. L. Comyn & Company, at recent bid openings.

Flat Boats Proposed, Cincinnati, O.—The United States Engineer Office, Cincinnati, Ohio, has under consideration the construction of three steel needle flat boats for use on the Ohio River dams. The cost will be about \$2,000 each.

Cargo Carrier Reconditioning, San Francisco, Cal.—The General Engineering Corporation of San Francisco has received the contract for the reconditioning of the Shipping Board cargo carrier Liberty Land, at a price of \$14,110.

Contract Awarded, Tacoma, Wash.—The Todd Dry Dock & Construction Company, Tacoma, Washington, has been awarded a contract for six steel barges for the U. S. Engineer Office, at Portland, Ore. It is understood that the total price is \$114,900.

Survey, etc., Quincy, Mass.—The steamer Mars, which recently grounded while leaving Boston on a trip to Norfolk, has been to the Fore River Shipbuilding Company's plant in Quincy for survey and repairs. It was found that some plates were damaged.

Fifteen-Barge Job, Sturgis, Ky.—The West Kentucky Coal Company of Sturgis, Ky., has awarded the contract for lumber for fifteen new wooden barges to the Marsh & Truman Lumber Company, Chicago. The Coal Company will build the barges at its plant at Paducah, Ky.

Boats Under Construction, Fort Myers, Fla.—A speed-pleasure boat, under construction at the Williams ways in East Fort Myers, and a concrete boathouse, being built by Contractor D. W. Ireland, west of Fort Myers, are being constructed for Med D. Kelum, of Fort Myers.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been awarded the work of installing a new fore-foot on the Standard Oil tanker Richmond, and also general repairs for damage sustained by fire on the American-Hawaiian fleet freighter American.

Steamers Reconditioned, New York, N. Y.—According to recent announcement, the American liner Manchuria and the Red Star liners Kroonland and Finland will be reconditioned in New York for the new service of the International Mercantile Marine Company to Pacific Coast ports.

Voyage Repairs, San Francisco, Cal.—The following were the bids received for voyage repairs to the Pacific Mail liner President Pierce: United Engineering Company, \$5,179; Bethlehem Shipbuilding Corporation, \$5,597; General Engineering and Drydock Company, \$6,149, and the Moore Drydock Company, \$6,695.

Small Craft for U. S. Engineers.—The United States Engineer Office, New Orleans, La., has awarded the contract for furnishing and delivering one inspection boat, complete, to Duvie Sons, at a price of \$2,963. It is reported from Wilmington, N. C., that the Engineer Office proposes to purchase one motor dredge tender.

Navy Cruiser Launched, Philadelphia, Pa.—The Marblehead, the fourth of five light cruisers built or now building at the yards of the Wm. Cramp & Sons Ship and Engine Building Company for the United States Navy, was launched from the ways of the company on Tuesday, the results of which proved satisfactory in every way.

Reconditioning Bids.—The General Engineering and Drydock Company, San Francisco, Cal., was

low bidder for reconditioning the Shipping Board steamer Liberty Land for spot service, when tenders were received, recently. The following were the proposals: General Engineering, \$14,110; Moore Drydock Co., \$24,227; Bethlehem Ship. Co., \$24,814.

Low Bidder, Tanker Repairs.—The Crowley Shipyard, San Francisco, Cal., was low bidder at the opening of tenders for extensive general repairs to the Shipping Board tanker Betterton. The prices were: Crowley Shipyard, \$4,200; General Engineering, \$7,490; Bethlehem Corp., \$7,680; Moore Drydock Co., \$7,797; United Engineering, \$8,150.

Bids for Repairs, West Coast.—At the opening of bids, recently for reconditioning the United States Shipping Board steamer West Montop for spot service, the Hanlon Shipyards, of Oakland, Cal., submitted the lowest tender. The following prices were submitted: Hanlon, \$15,620; General Engineering, \$17,252; Bethlehem, \$17,467; Moore Drydock Co., \$19,935.

Contract Awarded, San Francisco, Cal.—The contract for general repair work on the Shipping Board steamer West Prospect has been awarded to the Crowley Shipbuilding Company. The bids on the vessel were as follows: Crowley Shipyard, \$1,600; Main Iron Works, \$1,709; Theodore Smith, \$1,882; Bethlehem Shipbuilding Corporation, \$1,993; General Engineering Company, \$2,095.

Conversion Job, Brooklyn, N. Y.—The contract for converting the 3-masted commercial schooner Priscilla Alden into a motor yacht has been awarded by the firm of Tams and King to the Tebo Yacht & Basin Company, of the Todd Shipyards Corporation. The vessel is to be equipped with Frisco Standard engines and it is understood the contract will cost close to \$70,000.

Bids for Boiler and Fittings.—The Charleston Dry Dock & Machine Company, of Charleston, S. C., with a price of \$8,764, was low bidder for furnishing one steam boiler, with fixtures, stack, etc., for the U. S. dredge Upatoi, at the recent opening of proposals by the U. S. Engineer Office, Mobile, Ala. Two bids were submitted, the other being a price of \$13,820 by the Federal Shipbuilding Company, both tenders having been rejected.

Tug Launching, Los Angeles, Cal.—The new tug D. M. Renton, a sister-ship of the recently completed David P. Fleming, has been launched on the west coast. The vessel is 85 feet long, has a 250-horsepower Winton Diesel engine, and cost \$75,000. She will have a speed of 12 knots. The tug is being built by the William Muller shipyards, which has orders for three more such tugs for the Wilmington Transportation Company.

Shipyard Activities, West Coast.—The steamer Floridian has been placed on the drydock at the Bethlehem Shipbuilding Corporation's plant, San Francisco, for an overhauling and repainting. The Union Line motorship Huraki has gone on the drydock of the same company for propeller repairs. The freighter Steel Seafarer has been at the Moore yard, Oakland, for the replacing of three plates on the port side of the vessel.

Propeller Wheels, Philadelphia, Pa.—According to recent announcement a new set of propeller blades have been ordered from the William Cramp & Son Shipyards, at Philadelphia, for the United States Line steamship George Washington. The new wheels for the George Washington will be 21 feet 3 inches in diameter (the steamer now making a speed of 18½ knots), while those of the Leviathan, also cast by the Cramp Company, are 16 feet 6 inches.

Contract for Derrick Boat Hulls Awarded.—The Chief of Engineers, Washington, D. C., has awarded to the Dravo Contracting Company, Pittsburgh, Pa., a contract for nine steel derrick boat hulls, at a total price of \$130,140, delivery to be in 270 days. Six of these hulls are for the Louisville district of the Ohio River, two are for the Engineer Office at Rock Island, Ill., and the ninth is for use on the Green River, Ky.

Tanker Launched, San Francisco, Cal.—The Alaska Standard, building for the Standard Oil Company for use in Alaska waters, was recently launched from the ways of the Bethlehem Shipbuilding Corporation. The vessel is 210 feet in length, 40 feet beam and 16.6 feet deep. She will be equipped with two 400 horsepower Diesel engines, have a speed of about 12 knots and a carrying capacity of 12,000 barrels.

Diesel Installation on Admiral Line Ships.—The Admiral Line has called for bids on the transfer of Diesel engines from the wooden motorship Benowa to the steel auxiliary schooner Moonlite. Upon the installation of the engine the Moonlite will be placed in the coastwise trade. It has been stated that the conversion of the Moonlite is the first step to re-engine four ships of the same class with engines from four vessels of the Benowa type.

Contract for Dredge Awarded, Louisville, Ky.—The E. T. Slider Company, Fulton and Campbell streets, Louisville, Ky., has awarded the contract for a steel dredge boat hull and cabin to the Midland Barge Company, of Pittsburgh, Pa. The hull is to have a length of 176 feet, beam 50 feet, and depth 6 feet. The same company, which deals in sand and gravel, has awarded a contract for six heavy type steel barges to the Howard Shipyards, Jeffersonville, Ind.

Repairs, San Francisco.—The General Engineering and Dry Dock Company was low bidder on two reconditioning jobs, at recent tender openings. The work of reconditioning the West Mingo for spot service showed a bid of \$21,540 from the General Engineering Company, the other prices submitted being: Moore Drydock Company, \$23,644.55, and Bethlehem Shipbuilding Corporation, \$24,430. The company bid \$4,294 for general repairs on the Government vessel, General Frank M. Cox, and they were awarded the contract.

Vessel Repairs, West Coast.—At the opening of tenders for the carrying out of repairs to collision damage on the French Line steamer Montana, the Moore Drydock Company was low bidder. The work consists of repairs to her bow, covering the renewal of five plates, four plates to be faired up, fifteen new frames to be installed and new anchor stocks. The bids were as follows: Moore Drydock Company, \$22,495, 14 days; Bethlehem Shipbuilding Corp., \$25,960, 13 days; United Engineering Works, \$26,450, 16 days; General Engineering Co., \$27,000, 18 days.

Vessel Repairs, Brooklyn, N. Y.—The Robins Drydock & Repair Company, of the Todd Shipyards Corporation, Brooklyn, N. Y., was awarded the contract for repairing collision damage to the steamship West Arrow, at the opening of bids by the Shipping Board, at 10 A. M., on October 4, at 45 Broad Street, Boston, Mass. Six companies submitted proposals as follows: Robins, \$47,970, 38 days; Morse, \$47,955, 40 days; Bethlehem, \$48,750, 43 days; Atlantic Works, \$49,789, 39 days; W. & A. Fletcher, \$50,000, 40 days; Newport News, \$52,940, 32 days.

Repairs, Los Angeles, Cal.—According to information from Los Angeles, Cal., damage to the steamer Virginia Olson, which collided with the steamer Claremont in the Los Angeles Harbor recently, is estimated at more than \$30,000. It is said that oil tanks and bulkheads amidships must be removed before work can proceed on replacement of the damaged hull. It has also been announced that the steamers Meriden and Olympic have been ordered reconditioned with wider hatches, changed decks and other improvements. The work on the Meriden will cost \$45,000, with extras mounting to perhaps \$60,000. It has been stated that the vessels, which are already able to unload in three and one-half days, will be able to cut that time almost in half when improved.

SHIPYARDS AND DRY DOCKS

New Drydock, New Orleans, La.—The Johnson Iron Works, New Orleans, La., have a new drydock, 416 feet 3 inches long and 75 feet between wings, with a lifting capacity of 7,000 tons.

Drydock, Chester, Pa.—The Sun Shipbuilding Company has been negotiating for the purchase of one of the 10,000-ton drydocks owned by the Shipping Board, which is to be towed to Philadelphia. President Pew has admitted the company has taken the drydock under a lease with an option of purchase.

Union Shipbuilding Company Reorganizes Repair Department.—Word comes from the Union Shipbuilding Company, Baltimore, Md., of the company's reorganization of their Repair Department for the purpose of actively engaging in the repairing and drydocking of vessels up to 420 feet in length and 5,000 tons displacement while light.

Cannery Buys Shipyards.—Word comes from Seattle that the wooden shipbuilding plant at Houghton Lake, Washington, originally known as the Anderson Yard, has been purchased by the Alaska Consolidated Canneries from the Lake Union Drydock and Machine Works. The new owners will continue the yard in commercial business.

Shipping Board Dry Docks Leased.—Besides the leasing of one of the 10,000-ton drydocks of the Shipping Board to the Sun Shipbuilding and Drydock Company, Chester, Pa., the Shipping Board has also leased two others of the same type to the following: one dock, located at Weehawken, N. J., to the Todd Drydock & Shipbuilding Company, of New York, and the other dock, which is at Newport, R. I., to the Alderton Dock Yard, Ltd., of Brooklyn.

Drydock Purchased, Alameda, Cal.—The United States Shipping Board has sold a 16,000-ton floating drydock to the General Engineering and Drydock Company, the concern owning and operating the former Alameda Bethlehem plant. The General Engineering Company will tow the huge craft from the Atlantic to the Pacific, the drydock being the first one ever towed from the Atlantic to the Pacific Coast. The trip will require forty days or more and two Red Stack tugs will leave San Francisco bay to undertake the tow as soon as word is received from President George Armes, of the yard, that the preliminary details have been completed.

PORT IMPROVEMENTS

Pier and Derrick Plant, Owensboro, Ky.—The River Sand & Gravel Company plans to build a concrete pier with derrick.

Clam Shell Buckets, Pittsburgh, Pa.—U. S. Engineer, Pittsburgh, plans to purchase two 2-yard clam shell buckets.

Buckets, Mobile, Ala.—U. S. Engineer, Mobile, plans to purchase one 3-side orange peel bucket and one 3-yard clam shell bucket.

Canals, Fair Oaks, Cal.—Beach & Cox plan 4 mile canals, 11 feet wide at top, 4 feet at bottom, 2 feet deep; 2 centrifugal pumps, 31.1 sec. foot capacity, 12-foot lift.

Dock, Creighton, Pa.—Crucible Fuel Company, Oliver Building, Pittsburgh, plans new pile and timber dock at Creighton on the Allegheny River; cost to exceed \$25,000.

Port Work, Los Angeles, Cal.—The Harbor Commission of Los Angeles has awarded the contract for pier work, etc., at Wilmington, to the Griffith Company for \$21,221.80.

Levee, Kaufman, Tex.—Kaufman County Levee Improvement District 4 held an election on October 13 for the purpose of voting on \$175,000 bonds for improvements, alterations and repairs.

Dock, Mingo Junction, O.—Carnegie Steel Company, Carnegie Building, Pittsburgh, Pa., plans coke unloading dock, stationary crane on concrete caisson foundation, mooring piles, etc., here, \$50,000.

Breakwater, Francis Harbor, N. S.—Bids will be received by R. C. Desrochers, secretary, Department of Public Works, Ottawa, Ont., for a 301-foot concrete breakwater, 20 feet wide, Francis Harbor, at \$30,000.

Breakwater, Port Lorne, N. S.—R. C. Desrochers, secretary, Department of Public Works, Ottawa, received sealed proposals on October 22 for 50-foot extension to concrete breakwater, 45 feet wide, here, \$27,000.

Crane, Tacoma, Wash.—Port of Tacoma, National Bank of Tacoma Building, is in the market for a 90-foot electric crane with track and necessary operating equipment. \$50,000. Address G. M. Osgood, chief engineer.

Grain Elevator, Port Arthur, Tex.—Kansas City Southern Railroad, 11th and Wyandotte streets, Kansas City, Mo., is taking bids for a concrete grain elevator, 600,000-700,000 bushels, here, \$25,000. C. E. Johnson, c/o owner, engineer.

Dredging, Harlingen, Tex.—Sealed proposals were received by C. Brown, secretary, Cameron Water Improvement District 1, on October 22, for dredging 8-mile canal, 60,000 cubic yards excavation, etc., in Cameron County. \$25,000. A. Tamm, Harlingen, engineer.

Pontoon, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Court Building, on October 25, for a reinforced-concrete pontoon for the Ferry Landing at the foot of Canal street. J. H. Walsh, general manager. Requisition E. D. 14101.

Waterway Opened, Lake Okeechobee, Fla.—Lake Okeechobee, the second largest body of fresh water in the United States, has been linked with the Atlantic Ocean, sixty-five miles away. The inlet, which extends from the lake to the ocean, was formally opened with fitting exercises and will be navigable to yachts and freighters drawing not more than ten feet of water.

Wall and Dike, etc., Shreveport, La.—Sealed proposals were received on October 23 by S. G. Wolf, secretary-treasurer, for 1,000 feet of sheet pile toe wall, 24 feet deep, 2,200 feet of pile dike 55 feet deep, willow fascine or plank mattress under dike 100 by 2,200 feet, 20,000 cubic yards of grading and 25,000 square feet of creosote pavement. Alternate bids on long crib filled with brush anchored to piling. C. E. Smith, Railway Exchange, St. Louis, Mo., engineer.

Erection of Ferry Landing, New Orleans, La.—The Board of Commissioners of the Port of New Orleans will receive sealed proposals at their office, Suite 200, New Court Building, until 3 P. M., November 15, 1923, for furnishing and erecting the Ferry Landing at the foot of Canal street, New Orleans, Louisiana, approximately 175 tons of structural steel for a double deck, double drive ferry bridge, and 25 tons of bridge operation machinery. J. H. Walsh, general manager. Requisition E. D. 14122.

Shed Construction, Portland, Ore.—The Commission of Public Docks, Portland, has awarded a contract to O. R. Wayman for the construction of an addition to the main shed on the quay dock at terminal No. 1, which is to extend along the west side of the shed for a width of 47 feet and length of 900 feet, and has also approved an agreement with the Eastern & Western Lumber Company for the joint dredging and maintenance of a slip between the mill property and the north end of terminal No. 1, where Pier C is to be erected. The Commission has adopted the 1924 budget that totals \$1,157,770. Dredging of the new slip is to be undertaken by the Port or Portland and material removed will be used to fill part of the property, which was recently joined to the terminal holdings through purchase. Authority has been granted G. B. Hegardt, chief engineer, to advertise for the removal of part of the old piling on the river side of the land so dredging would be expedited.

GOVERNMENT WORK

Dredging, Providence, R. I.—Sealed proposals were received on October 17 at the office of the U. S. Engineer, for dredging 373,000 cubic yards in Providence Harbor.

Fill, Philadelphia, Pa.—Specification 4919—Bureau of Yards & Docks, Navy Department, Washington, D. C., plans filling back channel at Naval Hospital, here.

Bids Rejected, Pearl Harbor, H. T.—Specification 4827—The Bureau of Yards & Docks, Navy Department, Washington, D. C., rejected bids for fire protection system at Naval Operating Base, here.

Lumber, Paris Island, S. C.—Port Quartermaster, Marine Barracks, awarded the contract for 100,000 feet of lumber, various sizes, to Montgomery & Company, 10 South 15th Street, Richmond, Va. Engineers' estimate, \$5,300.

Contract Awarded, Jacksonville, Fla.—U. S. Engineer, Jacksonville, awarded the contract for 25 pontoon catamarans for the dredge Barnard to Novelty Steam Boiler Works, 917 South Howard Street, Baltimore, Md., \$24,350.

Piling, Owensboro, Ky.—U. S. Engineer, P. O. Box 72, Louisville, plans to purchase 500 piles, 25 feet long, and 1,000 piles, 30 feet long, not less than 12-inch butt and 8-inch tip. F. O. B. Owensboro, for Dam 46, Ohio River.

Dredging, Oakland, Cal.—U. S. Engineer, P. O. Box 72, plans to purchase 500 pieces of 12-foot, 500 pieces of 16-foot, 1,200 pieces of 20-foot and 400 pieces of 22-foot (all 2 by 12 inches) No. 1 common yellow pine f. o. b. Addison.

Dredging, Elizabeth River, Va.—Sealed proposals were received by the U. S. Engineer Office, Norfolk, Va., on October 30, for dredging in the Eastern Branch of Elizabeth River, Norfolk Harbor, Va. Further information on application.

Lumber, Rock Island, Ill.—The contract for furnishing 237,000 feet of Douglas fir for use at Le Claire Canal Lock, etc., has been awarded by the U. S. Engineer Office to G. T. Mickie Lumber Company, 30 North La Salle Street, Chicago, at \$5.037.

Dredging, Boston, Mass.—U. S. Engineer, Custom House, awarded the contract for dredging and disposing of 600,000 cubic yards of material from Beverly Harbor, to J. S. Packard Dredging Company, Turks Head Building, Providence, R. I. \$24.691.

Piling, Cincinnati, Ohio.—U. S. Engineer, Cincinnati, awarded the contract for furnishing sixty 30-foot taper piles, one hundred forty-six 40-foot and sixty 35-foot steel sheet piles for Dams 34, 36 and 38, to Bethlehem Steel Company, Cincinnati, at \$2.94 a hundredweight.

Discharge pontoons, Rock Island, Ill.—Sealed proposals were received by the U. S. Engineer Office, Rock Island, on October 17, for the construction and delivery of twenty 38-foot by 14-foot by 3-foot steel discharge pontoons. Further information on application.

Dredge Pump, etc., New Orleans, La.—U. S. Engineer Office, 329 Customhouse, New Orleans, La., will receive sealed proposals until 9 A. M., November 2, 1923, for constructing and delivering one 24-inch dredge pump and suction mouthpiece. Further information on application.

Breakwater Construction, Hilo Harbor, H. T.—Sealed proposals were received by the U. S. Engineer Office, Honolulu, T. H., on October 15, for breakwater construction, Hilo Harbor, T. H. Further information on application here or to U. S. Engineer Office, 401 Customhouse, San Francisco, Cal.

Repairs, Philadelphia, Pa.—The contract for repairs to substructure and deck portions of Piers 97, 98 and 99, Greenwich Point, Delaware River, Philadelphia, has been awarded by the U. S. Shipping Board, c/o J. M. Hoffman, Head, Division of Docks and Wharves, 1907 Navy Building, Washington, D. C., to E. Fay & Son, 2 South Mole street, at \$154,800.

NEW INCORPORATIONS

The Lake & Ocean Company, of Buffalo, capital \$65,000, chartered under New York laws, to operate steamers. Incorporators: W. F. Delaney and L. B. Olshei.

Coal Ports Transportation Corporation of Manhattan, capital \$10,000, chartered at Albany, to engage in navigation. Incorporators: J. A. Sheridan, A. E. Flanders and H. V. Boyle.

Davis Transportation Lines, Inc., capital \$350,000, incorporated in Delaware to own and operate steamships. Incorporators: Robert K. Thistle, Harry C. Hand and George V. Reilly, of New York.

Philadelphia & New York Transportation Company, capital \$5,000, chartered under Delaware laws to engage in the transportation of freight. Incorporators: C. B. Outter, S. B. Mackey and L. C. Christy.

Marmack Transportation Company, capital \$1,500,000, chartered under Delaware laws, to operate vessels. Incorporators: James A. McDavid, Harry F. Martin, Clayton C. Wright and Stanley Safreed, of Pittsburgh.

The Inland Water Line: principal place of business, Jacksonville; capital stock, \$250,000; limit of indebtedness, \$1,500,000. Corporate existence 99 years. General nature of business: To own, control and acquire by lease, purchase, construct, or otherwise, steamships, boats, barges and vessels of all kinds or interests therein, and to operate the same for transportation line for passengers and freight of all kinds, etc. Officers and directors: William H. Furrow, president; Damon G. Yerkes, vice-president; J. Henry Blount, secretary and treasurer. Letters patent issued, September 25, 1923.

Florida Canal and Transportation Company; principal place of business, Jacksonville; capital stock, \$3,000,000; limit of indebtedness, \$10,000,000. Perpetual corporate existence. General nature of business: To acquire, have, hold, use, enjoy, exercise and operate the canals, rights of ways, waterways, and rights and privileges, franchises, immunities, machines, houses, implements, appendages, appurtenances and properties being, pertaining to or used in connection with all or any of the canals and waterways which are or were of Florida Coast Line Canal and Transportation Company, a corporation created and existing under the laws of the state of Florida, and having been conveyed or mortgaged by the Florida Coast Line Canal and Transportation Company to the Rhode Island Hospital Trust Company as trustees, etc. Letters patent issued September 11, 1923.

SHIPPING DEVELOPMENTS

Megee Brothers.—Ralph D. Megee, of Megee Brothers, has purchased the British schooner Montclair. She was sold at a United States Marshal's sale in Camden, recently.

Mallory Transport Lines.—Announcement has been made by Rogers & Webb, Boston agents for the Mallory Transport Lines, of a new steamship service between Boston and South African ports, which opened last month.

Cunard Line.—Triangular steamer service between London, Boston and Portland, which was maintained last winter by the Cunard Line, will be re-established at the close of navigation in the St. Lawrence river this winter, according to information from Boston. The Vardalia will leave London the first week in December for Boston.

Construction Materials Company.—The Construction Materials Company of Chicago has purchased two lake type steel cargo vessels from the Shipping Board. The ships are the Lake Clear, of 2,875 deadweight tons, and the Lake Weir, of 2,875 deadweight tons. The purchaser agreed to install Diesel engines in the Lake Weir by the terms of the sale.

United American Lines.—According to announcement by Christian J. Beck, vice-president in charge of freight traffic of the United American Lines, the company will have a fortnightly eastbound intercoastal service calling at Boston and Philadelphia. This service is said to be in connection with the weekly sailings between New York and Baltimore and West coast ports maintained jointly with Houlder, Weir and Boyd.

San Juan Transportation Company.—The San Juan Transportation Company, of Bellingham, Washington, has purchased the steamer Astorian, which formerly operated on the run between Portland and Astoria and which has been out of commission for about three years. This ship is an oil burner with two stacks and is of a type similar to many vessels operated on Puget Sound, being 145 feet long and approximately 100 tons burden.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson,
U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York

President—E. A. Simmons.
Secretary—K. W. Heinrich.

The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irrving G. Keller.

Port of New York Authority

11 Broadway, New York
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building,
Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1600 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter.

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morrison,
Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Navale e Meccanici in Italia

Marine Engineering and Shipping Age

Volume XXVIII

December, 1923

Number 12

Published Monthly by
SIMMONS-BOARDMAN PUBLISHING COMPANY

30 Church Street, New York

JAMES SWAN }
H. H. BROWN } Editors

L. S. BLODGETT, Associate Editor

W. Z. GARDNER, News Editor

Contributing Editors

Rear Admiral C. W. Dyson, U. S. N.

William T. Donnelly

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MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), and the Audit Bureau of Circulation (A. B. C.)

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The Marine Congress

FOR the first time since the movement to encourage and promote the growth of the American merchant marine was initiated, a body of men, representing the general business interests of the country, has met together for the consideration of this great national problem, and is effecting a permanent organization to carry on the work and to co-ordinate and concentrate the various forces tending towards its successful prosecution.

The deliberations of the Marine Congress, composed as it was of representatives of a hundred different and widely varying commercial bodies and organizations, represent the result of matured thought and careful analysis of ways and means on the part, not only of those directly interested in shipping, but of merchants, manufacturers, farmers—in short of men representing the commercial interests of the entire United States.

That the country is awake to the necessity of a merchant fleet and to the very direct bearing which the possession of this fleet has upon the future prosperity of its citizens is becoming daily more apparent. There is no question but that the problem of placing American ships on the high seas and keeping them there will largely occupy the attention of the approaching session of Congress, and the submission to that body of a definite policy to attain this end will go far toward making effective action possible.

So far as can be judged by the daily press, a majority of the people have come to a realization of the fact that an adequate merchant marine is necessary, if the country is to retain any control of its export business, possess an efficient navy and in every other respect to hold its position as a first class

power among the nations of the world. It is equally apparent that a majority of the people are of the opinion that this merchant marine should be privately owned and operated.

It is important that senators and representatives should come to a realization of these facts. It is also important that they should understand clearly that the body submitting these facts for their renewed consideration is a national body and that steps are being taken to make it a permanent one.

The Shipbuilding Outlook

THERE is no disguising the fact that the "Naval Holiday," beneficial as its results may be to the world in general (and we are by no means certain that it is an "unmixed blessing," even in this particular) has given a staggering blow to the shipbuilding industry. The large shipyards have to a great extent attained their present size and perfection of equipment as a result of the demand for battleships, and for many years it has been the foundation of large naval work which has made the building of others and less important vessels economically possible. Now that this foundation is to be removed, what are the possibilities of continued operation for these large and costly "private navy yards"?

A large shipyard includes in its operation many mechanical trades or lines of work, and the individual shops of which it is comprised can each produce articles of general value. Such a plant, however, if properly laid out for economical ship production, does not lend itself readily to manufacturing processes, and to fit it for successful competition in such fields considerable modification is necessary. It is idle to suppose that an ordinary shipyard structural shop can, in the long run, successfully compete with a modern bridge shop, nor that a shipyard machine shop and boiler shop can economically produce locomotives. A shipbuilding company can, of course, alter its shops to produce successfully almost any structure or machine, but it then ceases to be a shipyard, although it still has the enormous investment in shipways, cranes and heavy machinery hanging on its neck and serving only to keep up maintenance and overhead expenses.

Mr. Powell, in his speech at the annual dinner of the Society of Naval Architects and Marine Engineers last month, stated this condition clearly and frankly, and his suggestions as to how it may best be met appear to us as sensible and worthy of the careful consideration of everyone having the welfare of the shipbuilding industry at heart.

Discouraging as the outlook appears in the aggregate, it is by no means, as some pessimists would have us believe, as

bad as possible. Shipbuilding in this country is a very long way from being dead. Many vessels are under construction, and it is altogether probable that a larger number will be required in the future, but the volume of work, as represented by the amount of money expended, will probably not equal that of the era of battleship construction for many years to come.

Mr. Powell suggests that, from every point of view, it is better to meet the future demand for ships with a relatively small number of yards, working efficiently and at something like normal capacity, than with a large number, each working at a fraction of the output necessary to carry its overhead and all facing eventual and inevitable disaster.

Hard as this suggestion may be in its accomplishment, the logic of it is unquestionable. So far as can now be seen, the eventual prosperity of American shipyards can be assured only by a process of elimination and combination whereby such a number of efficient yards will be kept in operation as bears a reasonable relation to the total amount of work to be turned out.

Shipping Board Economies

THE record of the various economies already effected or being put in practice by the operating department of the Emergency Fleet Corporation reflects credit upon those responsible for the operation and maintenance of the Shipping Board's fleet.

With the detail methods of operating the government vessels we are not familiar, but the steps taken in this connection to prevent waste and eliminate unnecessary expense appear entirely reasonable and, judging from the figures given, are producing satisfactory results.

In one particular, however, we are inclined to take issue as to the entire wisdom of the policy being followed. This is in relation to the care of laid-up vessels. Fundamentally, the greatest saving possible would result from the elimination of all vessels (and there is a very considerable number of them) which have no commercial value, thus, at one stroke, cutting out a large part of the present expense of upkeep, as well as removing a fleet of ships, which, while it will not in all human probability ever be commercially employed, is, nevertheless, a menace to the satisfactory settlement of the country's shipping problem.

We realize quite well that the sale or other disposal of laid-up vessels is a matter quite outside the jurisdiction of the operating department, and mention it only to indicate our belief that a major and not a minor operation is needed to satisfactorily solve the laid-up ship problem.

Turning then to the methods pursued in caring for these vessels, we believe that everyone will agree as to the wisdom of fleet concentration with the consequent reduction of caretaking personnel, as well as the elimination of wharfage charges. The physical care of the ships, however, may easily be neglected to the point where serious deterioration sets in, and we fear that this point has been reached, or will be shortly, by practically all of the laid-up ships. Although the total of the laid-up fleet personnel appears at first glance a large one when the number of ships to be cared for is taken into consideration the number of men available per

ship becomes entirely inadequate to properly handle the situation. By eliminating "dead" tonnage and concentrating upon potentially valuable vessels, effective upkeep might be maintained without a greater total expense than at present. We believe, however, that the more valuable ships should be cleaned, painted and otherwise thoroughly preserved at the earliest practicable date. With this properly accomplished, a laid-up crew of very moderate size can render all the attention necessary for a long time to come. On the other hand, the ships are in a condition where a year or two more at the present rate of depreciation will render them useless or at least in a condition requiring extensive repairs to fit them for service.

Weakness of the Shipping Board

IN an address on the Shipping Board at the Marine Congress dinner recently given in New York, Commissioner Haney made, in substance, the following rather interesting and unique statement: "When I was asked to become a member of the Board, I hesitated considerably before accepting as I felt that I had but little knowledge of shipping affairs. However, my friends advised me to accept as I 'certainly knew as much about it as any of those other fellows.'"

We have no doubt as to the ability and personal integrity of Mr. Haney, nor indeed of that of the other members of the Board; but does not the above statement go far to explain the apparent lack of cohesion shown by the actions of the Shipping Board, its failure to work in sympathy with private owners and operators and, finally, the enormous expense involved in its activities?

It seems to us that it is about time for this very important body to be composed of men whose lives have been devoted to the work which the Board was created to oversee and foster, and that the fact that a man is considered "to know as much as those other fellows" is not a sufficient recommendation for membership.

Even were the Board made up entirely of men peculiarly fitted for the work, the possibility of effective functioning as an executive body is remote. In an advisory capacity, a committee of seven may be desirable, but for prompt and efficient executive action a much smaller body is essential; and one good man, if he could be found, would produce more and better results than any committee could possibly accomplish.

The present attitude of the administration apparently makes inevitable the continuation of the Board's activities for some time to come. Assuming this to be the fact, cannot steps be taken by the forthcoming Congress to reduce the Board to a workable size and restrict its members to those having expert knowledge of the questions which they are called upon to decide?

Work of great value has been accomplished in certain of the departments comprised in the Board's activities. Its members should have sufficiently expert knowledge to appreciate the importance of such constructive results as have been attained and to so direct its line of action in the future that it may be a help and not a hindrance to the development of the merchant marine.

Secretary Hoover Declares Our Merchant Marine Indispensable for Protecting Our Foreign Trade

Address of the Secretary of Commerce at the Marine Congress Banquet Shows How Double Taxation of American Merchants Abroad Is Handicapping Growth of Our Overseas Shipping

AS the principal speaker at the Marine Congress banquet held at the Waldorf-Astoria Hotel, New York, on Thursday evening, November 8, under the auspices of the American Marine Association, Herbert Hoover, Secretary of Commerce, reiterated the facts so well known to all ship-minded American citizens that we must have our own ships for the protection of our foreign trade, for the expansion of our exports and for our national defense but he also pointed out one disastrous handicap to the growth of our merchant marine which is generally overlooked but which is capable of remedy and that is the double taxation of our merchants abroad. Secretary Hoover's address was as follows:

It is simply a truism to say that we must have an American merchant overseas marine. Entirely apart from the fine sentiment and national pride of a great trading nation in keeping its flag upon the seas, we must have our own ships for the protection of our foreign trade; we must have ships if we would expand our exports on sound lines and we must have them as an auxiliary to our national defense.

OUR STANDARDS OF LIVING DEPEND ON INTERNATIONAL TRADE

It seems worth repeating at times that our international trade is one of the very foundations of our standards of living; that our whole fabric of living and comfort are dependent upon the import of commodities which we do not and can not ourselves produce—tin, rubber, coffee, sugar and a score of others; further, in the main the amount of these commodities we can import will depend upon the volume we export. Moreover we need a constant expansion of our export markets to give stability to our internal production by a wider range of customers.

If we are to have secure export markets we must have some sound proportion of American controlled shipping to assure us against combinations in rates which would prejudice our goods in competitive markets. Nor have our merchants been without the experience of finding that the transport of our goods in foreign bottoms has been taken advantage of by our competitors to learn the details of our trade connections.

The facility of the world in creating combinations in restraint of trade has been growing by leaps and bounds since the war and while we, as a nation, endeavor to curb these activities within our borders, there has naturally been no curbing of these activities abroad when they affect American interests. Today there are many commodities upon which we are dependent by import from foreign lands in which there are combinations in control of price in those foreign lands. Combinations in control of sea rates are the commonest thing in the world shipping fabric. Many of our raw material exports, such as wheat, are sold in the world market in competition with those of other countries and the price level in these cases is the result of competitive streams that flow into these world markets. In wheat the farmer's return is fundamentally the price which he receives at Liverpool less the cost of transportation and handling. Therefore, any increase in shipping rates is in fact a deduction from the price to the farmer. It is just as important to him to be

guaranteed reasonable rates of sea transport as of land freight.

The real security is an American-owned merchant marine. In the long view the expansion of our foreign trade must and will take place in the export of larger proportions of manufactured goods. The primary requisite for such expansion is the assurance of regularity in transportation. Not only do we need regularity of sailings week by week, in order that the manufacturer may be assured in his problems of delivery, but our merchants and manufacturers require to know that when they have established their goods in foreign lands then regular transportation will be assured to them over years to come. They can not be dependent upon hazards of foreign shipowners, allied as these owners are with foreign merchants and competitors.

ADEQUATE TRANSPORTATION UNDER OUR FLAG A NECESSITY

We must have especially regular and positive transportation under our flag on those great trade routes where our commerce can and will expand. Nor can America be dependent for her movement of overseas goods upon the make and break of peace and war in different parts of the world. We have had one gigantic national experience with this already. We must have ships under our own flag, if we are to have security in our vital supplies and exports when other nations go to war with each other. As an auxiliary of our national defense we must have preparedness in transport for soldiers and supplies; we must have a training ground for our sailors, or our Navy itself would be helplessly confined to our own coasts.

In a broad sense the American people are endeavoring to establish a merchant marine that will adequately protect and promote our commerce. The ideal is regular, ferry-like service of boats of the cargo liner type with some passenger capacity traversing the great trade routes of the world and carrying at least 50 percent of our foreign trade. Today, outside of oil, we are carrying less than 20 percent. Some day we will attain such a merchant marine. Our national necessities, the capacity of our people for organization, for mechanical development and enterprise will some day bring it about. In the meantime we have much divided opinion in public mind, in the shipping world and in Congress, as to method. And our shipping world is suffering from great handicaps.

AMERICAN MERCHANTS NEEDED ABROAD

It is not my purpose to review all these handicaps that are so familiar to you but rather to present to you one single phase that has not been so generally considered that is capable of remedy. That is the relationship that American merchants abroad must bear to the success of an American merchant marine. We will never have a real American merchant marine until we have a much larger complement of merchants of our own nationality conducting our commerce in foreign ports. Our raw materials are largely sold at our shores to foreign merchants. They dictate the shipping. Again most of our purchases of raw materials are for delivery at our shores. The foreign merchant again controls

the shipping. If we except oil, most of our manufactured goods for export are dealt with by foreign merchants. How real all this is, is shown by the fact that except oil only about 12 percent of our imports and exports were managed by American merchants abroad.

The situation is just as insecure for our exports as for our shipping. If we would make sure of the continuous flow of goods, we must have the American on the ground distributing to the foreign retailer, securing business by his services as well as his price. Many an American merchant has seen his established trade disappear because he depended upon a foreign merchant not to show patriotism to his own country. This situation has been contributed to by the tendency of some of our manufacturers to regard export as a happy hunting ground in times of domestic depression, to be abandoned in times of domestic demand. We cannot have a merchant marine without an army of American merchants in foreign ports. This is the foundation of our British competitors.

No stable consumption of goods can be built upon such a fabric. And other things being equal, the merchant ships his goods under his own flag, even giving a preference to that flag. Our competitors certainly do so. The lack of growth in our merchant personnel abroad is, I believe, to a large degree the fault of our Government for reasons I will detail later.

Despite our expanding export and import trade, the number of our merchants abroad has decreased in late years and yet if we would have a merchant marine they must be increased. The taxation policies of our Government have been to a considerable degree responsible for this situation.

OUR MERCHANTS ABROAD FORCED TO PAY DOUBLE TAXES

We are asking our people to expatriate themselves in order to sell American goods and manage American ships. Our own Government demands in income and corporation taxes up to 58 percent of the profits of our merchants resident abroad. They also pay taxes to the government where they reside. Thus we demand that they pay double taxes. We are the only nation who does such a thing. With tax burdens even greater than ours, our competitors in the world today have freed their merchants resident abroad from this double taxation. For instance, an American merchant firm in London today must pay British taxes amounting directly or indirectly up to 50 percent of his income. The American Government comes along and claims the same sum or even more. In countries not participants in the war, such as the Argentine, the British merchant pays no taxes to his home government, whereas our merchant must pay his taxes in full.

It is, therefore, felt by many as more economic for Americans to stay at home and sell their goods in the Argentine through a German or a British merchant. Scores of our merchant firms, totally discouraged, have thrown up the sponge.

AMERICAN ENGINEERS FIND FOREIGN MISSIONS UNPROFITABLE

Before the war, there were at least 1,000 American engineers employed at substantial salaries in the territories of our former allies. These men went abroad to install American methods, American machinery and equipment in the production of raw materials, and in transportation. These salaried workers now find themselves subject to two gigantic income taxes and thus their foreign mission is unprofitable. I doubt whether there are 100 of them left in foreign territories today. A vast amount of American machinery and equipment that followed in their wake has dried up.

There is one phase of this matter of vital importance to our farmers. Over 80 percent of our agricultural exports go to Europe. Before the war European merchants bought stocks of wheat and grain during our fall marketing season and thus assisted in financing the crop. They carried stocks

in European warehouses thus relieving our congestion. Today, shortage of finance and credit leads them to buy from day to day and thrusts the burden of carrying the world's seasonal reserves either upon our own farmers or upon our merchants. If our merchant firms were established in Europe, it would be possible for them to give delivery at that end and to establish short credits to their customers—all of which would relieve our farmers. But American merchants are not likely to establish in Europe and to pay two income taxes which might absorb up to 75 percent of their income.

Another case of pertinent order is that on the China coast. Inasmuch as China has no dependable corporation law much Chinese capital is invested in foreign corporations under the management of, or in partnership with, Europeans. As foreign governments exact no home taxation from such corporations or their stockholders the Chinese naturally prefer them. We attempted to remedy this by Congressional authority to establish special American corporations under Federal authority but the restrictions are such that the act has failed its purpose. Three large American managed businesses have gone over to control of our competitors at a real loss to our foreign trade and the great discouragement of our merchants. Similar questions are arising in the Philippines.

DISPERSION OF AMERICAN MERCHANTS ESSENTIAL TO DEVELOPMENT OF OUR SHIPPING

I wish to repeat that, if we are to secure the establishment of a merchant marine, we must secure dispersion of the American merchant and our Government today is one of the most destructive influences in the whole matter. I do not wish to argue the theory that Americans who are engaged abroad in reproductive work should not bear their share of the national burden. I would only point out that other nations have found it is uneconomic to impose this burden upon them, and that we are left in a prejudiced position. Nor am I pleading the cause of the American expatriot, who prefers foreign civilization as a luxury, who is bringing no returns to his country by way of his savings or by way of his expansion of American trade.

These two groups are quite distinct. They can be distinguished in tax measures so as to apply the relief only to incomes earned abroad. One is tied passionately to his country's interests and the expansion of its welfare; America to him is the home he serves in managing her trade. He will yet return with his savings to add to the national wealth, whereas the other is but a pensioner on our national resources. And yet as a nation we penalize the one who brings us service and credit.

Notice to Subscribers

THE annual index of MARINE ENGINEERING AND SHIPPING AGE for the year 1923 will be published separately from the magazine at the end of the year. As the complete index will be useful only to those of our subscribers who have kept a complete file of the magazine for the year, only a sufficient number of copies will be printed to meet the requirements of those who notify us before the end of the year of their desire for a copy.

A copy of the annual index will be mailed without cost to each subscriber whose request for it is received at our New York office on or before January 1.

To Develop Foreign Trade—

Ship and Sail in American Vessels. Money Spent for This Service Should Be Developing Our Own Maritime Resources, Not Those of Our Competitors

By "Old Scotch"

ONCE upon a time a prosperous farmer in the great West, who was supposed by his neighbors to be a good business man, ordered 50 tons of fertilizer from a distant point for the annual requirements of his vast acreage and in due course it was delivered at the railroad station, located five miles from his home. It was early spring-time and there was nothing much to do except to attend to the daily chores. His four horses were largely employed in eating their daily rations of hay and corn, the two hired men attended to the chores night and morning and loafed most of the day. The two farm wagons had not been used much during the latter part of the winter and needed some small repairs and a general greasing up to put them in good working condition. Much to the surprise of the loiterers around the railroad station, this supposedly good business farmer appeared one day and made arrangements with a Scandinavian teamster to haul the fertilizer out to the farm at a rate of three dollars a ton, thereby decreasing his account at the village bank to the tune of one hundred and fifty dollars. In a group of the wise men who always gather around the stove at the village store this conversation took place:

"I see that old man Perkins (for that was his name) has hired Olsen to cart that fertilizer out to his farm and by Heck he paid him three dollars a ton for doing it. His own horses are eating their heads off and the two hired men will soon want patches on their pants, and they won't be sewed on their knees either."

"Yes," said the second wise man, "he allowed to me that it wouldn't pay him to haul it himself as his two wagons needed about fifteen dollars' worth of repairs, and anyway it was getting too near planting time to bother with doing his own hauling."

"Well," said the storekeeper, the usual arbitrator in all such discussions, "Perkins better watch out as I've seen the sheriff put a red flag on better farms than his where they've been run by just such bum management as that."

Suppose this village store jury, composed, as the thousands of them are, of good, hard working, common-sense taxpayers who go to make up a great part of the American public, should cast their critical eyes and sound logic on the way Uncle Sam treats his merchant marine, don't you suppose they would find many parallels to Farmer Perkins' unbusinesslike procedure of hiring a man to cart the fertilizer from the station while his own facilities are growing cobwebs?

CUBAN SUGAR OFFERS OPPORTUNITY TO AMERICAN SHIPS

Suppose, for example, it dawns upon them that the Cuban sugar crop, used almost entirely by the American people who have the largest sweet tooth of any peoples in the world, is brought to our Atlantic ports every year by alien ships, while several of our large rivers, which empty into the Atlantic Ocean, are harboring vast fleets of idle ships owned by the government. And among these fleets swinging idly at their anchors are ships whose size especially adapts them for traffic to Cuban ports where the sugar shipments are made. As the sugar season is in the winter months, hundreds of seafaring officers and men are idle and available

to man these ships; repair yards and drydocks are only partly employed and willing and anxious to put these ships in condition for this trade. Does not this condition almost parallel the action of Farmer Perkins?

Before me as I write this is an item in one of our commercial dailies which reads as follows:

AMERICAN COAL EXPORTED IN FOREIGN SHIPS

"An American firm has just closed a contract to supply French Government Railways with 100,000 tons of American coal at \$7.25 c.i.f. It was learned yesterday that steamers of the Lloyd Royal Belge fleet will move this coal in equal monthly shipments at \$2.25 per ton during 1924."

Can you imagine that any shipper in Great Britain, receiving such an order as this, would for a moment consider delivering the coal in any but British bottoms? No, and very properly he would specify that the coal was to be delivered in English ships. We are so accustomed to being the "International Good Thing" that we overlook the fact that this might be an opportunity to keep this \$225,000 freight money in our own pockets. It is particularly interesting in connection with this order to note that the money for the freight is to be paid by the French government as the coal is to be used on their own railways, and so far as can be ascertained, there has been no interest paid on the huge war debt which France owes to this country, not to mention any attempt having been made to fund the principal as Great Britain has already done.

This money so generously loaned was obtained from the sale of Liberty Bonds and has not yet been repaid. As the bonds become due, it will be wrung from the pockets of every one of us now alive and probably from the pockets of our children and grandchildren. Each man, woman and child in the United States today is contributing by taxation, directly or indirectly, to paying the interest on these bond issues. Is it not time that "self-interest" should assert itself in this country? We are the most generous people on earth and we are all proud of it, but there comes a time when generosity is carried to an extreme. Those of us who pay direct taxes are complaining bitterly about the high cost of all commodities and we will never see the cost of living come down to normal conditions, until its prime cause, excessive taxation, is ameliorated.

In the case of the carrying of this coal abroad, if it were carried in government-owned ships and not a cent profit was realized in the transaction, the men who operate the ships, who furnish their supplies, and who make their repairs, would at least be making living wages and could help in paying taxes to be used in settling bond interest, which must be paid periodically, as the result of our generous impulses in loaning money to our European friends when they were in trouble. There should be justice in all transactions, and instances of this kind illustrate why we should be just to ourselves.

AMERICAN SHIPS SUCCESSFUL IN COFFEE TRADE

One of the finest examples of this kind is exemplified in the great American coffee cup. For years every American

who drinks coffee at breakfast has been paying tribute to foreign shipowners as no coffee is raised within our own continental borders. The great bulk of it has been and is now shipped from Brazil. Prior to the Shipping Board's establishment of lines to South America, the vast quantities of this staple commodity were carried to our shores in foreign bottoms. When we entered the coffee trade with our own ships, foreign competition, in order to scare us off from what they considered a vested right, reduced the cost to as low as 35 cents a bag from Santos to New York. Not scaring very easily, the Shipping Board continued these lines at a loss to the Treasury, and when it was seen that we were exercising our rights in this great trade, the freight rates have been advanced to what is a reasonable return from the shipments, and what is undoubtedly a much lesser rate than would now be prevailing, if there were no American ships in the business. Today we are carrying over 70 percent of this commodity, and the money for that service is being kept in our own pockets where "self-interest" dictates that it should be.

It is pleasing also to note what a little "self-interest" is doing in regard to our exports. Prior to the time of starving these South American lines, our exports to our American neighbors were almost negligible. Europeans, having ships, grabbed the business from under our very noses. Today, after only five years of American ship service, our exports southward have advanced by leaps and bounds. We now control the automobile trade in all countries of South America where American ships touch. See how far-reaching that one item of export is to our national prosperity. Thousands of people all over the country, but principally in the mid-West, have benefited by our increased sale of motor cars in a market which we had barely touched, and could barely reach before the advent of American ships to South American ports.

Of all our great industries which make us the most prosperous nation in the world, none will pay greater returns to the people at large than to maintain and build our own ships to extend our foreign trade. Self-interest in these lines of our industry will indeed be "good business" no matter how you approach it. Let us all take seriously the advice of Polonius to his son, "To thine own self be true."

Navy and Marine Memorial Dedicated to Americans Lost at Sea

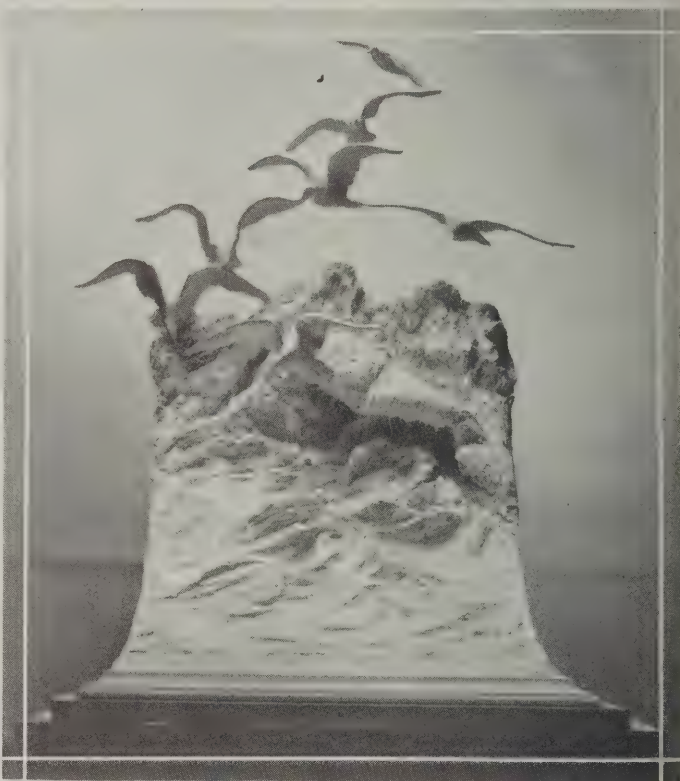
WHILE the vital part played in our national life by the Navy and the merchant marine is fully appreciated by all thinking individuals, a public and national recognition of it is lacking and greatly needed. Innumerable memorials have been erected to commemorate various kinds of service in national life and activities in war and peace by exalting in tablets, medals and monuments of all sorts, deeds and virtues of individuals reflecting the ideal of sacrifice and worthy endeavor. However, service on the seas by the Navy and the merchant marine, though enormous in its portent and fraught with dangers and with great sacrifice, seems to have passed without appropriate national recognition. A movement is now on foot for the erection of a Navy and marine memorial to be dedicated to Americans lost at sea and to service on the seas.

The national committee which was formed to further the plan to erect this memorial includes: Col. Roosevelt, assistant secretary of the Navy; Admiral Benson, United States Shipping Board Commissioner; Chairman Farley, of the United States Shipping Board, and many others prominent in civil life and in the service. The executive committee of this naval memorial movement includes Col. Robert M. Thompson, Admiral Fiske, Walter Firth and others.

Preliminary information obtained from the historical section of the Navy Department indicates that the casualties in

naval and merchant vessel service during the war amounted to 299 ships flying the United States flag. The Americans lost in these vessels numbered 1,745. The total casualties in the United States Navy personnel during the war amounted to 7,367 officers and enlisted men, while the number of American troops lost at sea while being carried to the other side on foreign ships is very large. In addition, there were many non-combatants who lost their lives on torpedoed passenger vessels.

These great losses on the sea and the thought of the solitude and silence that surround them have inspired a monument of strictly marine character. The monument represents a wave or section of a wave with seven seagulls hovering over it. It is to be cast in bronze and the dimensions will be 19 feet by 29 feet by 32 feet. When mounted on its pedestal and foundation of marble the monument will be, from the ground to the topmost bird, 42 feet high. The greenish



Model of Navy and Marine Memorial

and blue patinas of the bronze will naturally reflect the colorings of the sea.

The work is of masterly execution and in its inspiration and conception opens up a new field in the history of creative art. It will in itself establish a permanent art interest in marine affairs for the country and show our gratitude for acts of bravery, the risks taken by sailors at sea and the long and faithful service of our Navy.

The monument design received favorable comment from artists and critics during its exhibition at 12 West 8th street, New York City, where it was shown in the studio of Daniel Chester French, the sculptor. Those who have seen it have expressed the opinion that it should be erected as a national monument, as a fitting memorial to Americans who have died in service on the seas.

The Capitol at Washington has been considered the most favorable location for such a memorial because it is the center of national interest, because it is readily accessible and because it would afford the serene background appropriate for the monument.

Any further information desired will be gladly furnished by A. M. Graham, 125 West 11th street, New York.

Shipbuilding in Great Britain Now at Lowest Ebb

Improvement Depends Upon Clearing Up of European Politics and International Relations and Absorption of Surplus Tonnage

By James Swan*

THE present unfavorable situation in the shipbuilding industry in Great Britain is the result of many different influences, all arising more or less directly from the war and the general state of disorganization left in its wake.

The unsettled conditions on the continent, particularly in the Ruhr valley, make a general and orderly revival of European trade at present impossible, and this affects more or less directly all other trade routes. The delay in general economic revival, more than any other single influence, is causing the unprecedented lack of demand for tonnage.

Of scarcely less influence upon the situation is the surplus of tonnage caused by the tremendous production of merchant vessels during and directly following the war, not only in Great Britain but in other countries which up to that time had not held important positions in overseas trade. The net result of this great shipbuilding activity, notwithstanding the enormous losses of ships due to submarine attack, has been to give the world in 1923 a far greater merchant tonnage than existed in 1914 and this in the face of a most acute trade depression.

It is not to be wondered at, in view of the conditions cited, that British shipping and shipbuilding activities are today at a low ebb, nor is it possible to foresee any substantial improvement until the horizon of European politics and international relations has cleared and the existing surplus of merchant vessels shall be absorbed.

LABOR SITUATION ANOTHER DRAWBACK

Concurrently with the depression already mentioned, which is world-wide in its effect, the British shipping industries are confronted by other difficulties at home. Chief among these is the labor situation. While strikes and similar agitations are by no means confined to Great Britain, they appear to be more far-reaching and of more serious and sinister effect there than elsewhere. Notwithstanding the low ebb which the business has reached and the dearth of new orders, there are still a considerable number of ships under construction and promise of some more, which will have to be built if existing lines and sailing schedules are to be maintained. One would suppose that at such a time the workers would be thankful for the little work that is in hand and by their efforts contribute to its execution promptly and economically. On the contrary, this peculiarly inopportune moment has been chosen for the declaring of a boiler makers' strike and in consequence nearly every shipyard is practically tied up and work has ceased, to the very great financial loss, not only of the workmen themselves but of the owners of the yards as well and of the other industries more or less dependent upon them for support.

Bad as is this situation in its present effect, it is having

a deeper and more serious influence. Continued unemployment is forcing the emigration to America of large numbers of skilled shipyard employees. Particularly is this true of the Clyde district where every outgoing ship is reported to be filled. These men, had they remained at home, would have continued in idleness, with no trade other than their own open to them, such is the strength of precedence and habit as well as union organization in the "Old Country." Once in the United States or Canada, however, unlimited opportunities exist, as a really skilled shipyard mechanic is useful in many different lines. This flow of emigrants is a matter of national importance and is being viewed with grave concern by those who have Britain's commercial welfare at heart.

As is usual in periods of industrial unrest, the productive

efficiency of the men has suffered, and British shipyards are, as the result of the keen competition brought about by the small amount of work offered, losing many contracts, particularly in the line of repairs, to German and Dutch concerns. It is only too apparent that, if Great Britain is to retain her position in the shipbuilding world, she will have to put her industrial house in order, and that in the near future Germany, once her present difficulties are settled, will prove a more formidable competitor than ever and one which can be successfully met only by the

Probably there has never been a period, certainly not within the memory of those at present engaged in the industry, when British shipbuilding has been at so low an ebb as now exists. Furthermore, it does not seem possible to predict, even in the vaguest manner, when a material improvement in conditions may be looked for. The general opinion appears to be that the lowest point of the "slump" has been reached and that any change will be for the better but few will venture any prediction as to when a change will come.

best of cooperation between employer and employee and hard work on the part of both.

SHIPS UNDER CONSTRUCTION

Turning to the detail of what is actually being done in shipbuilding; there is a small amount of work under way, mostly, up to the present, consisting of replacements of liners and similar large vessels lost during the war and necessary in order to continue established services. There are also some cargo vessels built and building for companies which maintain regular schedules, although it is doubtful if any of them can make money under present trade conditions.

Coming to the more technical or engineering side of the shipping business, the Diesel engine, in its various forms, is probably the most important question before British shipbuilders and operating engineers at the present time.

It is generally admitted that the Diesel has passed the experimental stage and has now entered upon a period of development, but it is pointed out by many shipowners that there are certain drawbacks or limitations to every type so far developed and that there is rather a long road yet to travel before anything approaching a standard type of engine is arrived at—in other words, a Diesel which represents a degree of development in internal combustion engines, similar to that held by the triple expansion engine in steam engineering.

Uncertainty as to the type of engine best to adopt, doubts

*Editor of MARINE ENGINEERING AND SHIPPING AGE.

as to the possibility of obtaining a supply of suitable fuel oil at all ports and the difficulty of obtaining trained engineers all contribute to an attitude of doubt in the minds of many shipowners as to the advisability of large investment in motorships. There is, however, such a small demand for ships of any type that it is not possible to say what the policy might be were trade conditions normal and shipping a remunerative investment.

In the meantime, a most active interest is taken in motorships and everything connected with them. Various types of Diesel engines are being developed by different builders, and there are several which give satisfactory results. By far the larger number at present in use are of the four-cycle type, but the two-cycle seems to be regarded with increasing favor, although it has not as yet had the benefit of such extended use, and consequent operating experience, as the four-cycle.

In general, the superior economy of the Diesel engine is readily admitted and its eventual general adoption considered as certain, but until trade conditions have greatly improved and the demand for ships is such as to justify the greater expenditure involved, an extended adoption of this class of machinery does not appear probable.

Owing to the very considerable weight of the Diesel engines at present being commercially produced, their use has been practically confined to vessels of relatively low power, although at least one large motor passenger ship is under construction. It seems altogether probable, however, that installations of Diesels in high speed ships of great power will become a possibility in the not distant future. Double acting engines of both the four-cycle and two-cycle types are now under construction or in experimental operation which promise a very considerable reduction in weight per horsepower, and this, coupled with the great saving in weight of fuel and fresh water made possible by this type of machinery, would seem to indicate the early advent of the Diesel-driven passenger liner.

THE SUPPLY OF OIL FUEL

The question of oil fuel supply, both for motorships and

Get Out of the Shipping Business

WE trust the coming congress will disentangle its common sense from its politics long enough to get the government out of the shipping business.

The United States is not socialist. Our people in the main do not want the government to run business, although under one provocation or another they have permitted a considerable extension of political control over private activities. But the business of shipping is about the last industry which a government is fitted to manage. Success in building up and operating profitably a merchant marine can only be won by a complicated combination of private initiative, world-wide knowledge and experience of transportation, traffic and merchandising. Its problems are many sided and fluctuating. No sensible man who knows anything about the conditions with which the expert in shipping must deal can hope that a government bureaucracy, even if it could be free from political pressures, could evolve or direct successfully a great national marine.

We believe every man in congress, except a few impracticals or politicians hoping to win votes on the government ownership appeal, realizes this to be the unquestionable fact. Then why not have the courage to act up to it and stop now the money waste of government operation and the injury to private enterprise which government operation inflicts?

The first loss to us is told in statistics. The second cannot be, but it is a worse evil. We cannot hope for a vigorous growth of American shipping as long as private enterprise has to fight the unlimited resources of the government. The whole nation is injured by this obstruction. It should be removed without further procrastination, even though a large sum has to be charged off on our books to get free. It will not be as large a loss as we are suffering and will continue to suffer from the continuation of government management.
—*The Chicago Tribune.*

oil burning steamers, is receiving much attention. In some quarters, the permanency of this supply is apparently looked upon with some doubt, although with the Persian oil fields at her command it would seem that Great Britain has little to fear on this score. Many leading engineers and shipowners are of the opinion that oil is too valuable to be used for the generation of steam in any ships other than those of relatively high power, and that cargo vessels, particularly tramp steamers, should use only coal. The necessity of conserving the available supply of fuel oil is being advanced as an argument for the adoption of Diesel engines, but until oiling stations are distributed along the world's trade routes to meet all possible requirements, the general use of these engines in tramp steamers appears doubtful.

TRADE DEPRESSION GIVES OPPORTUNITY FOR SCIENTIFIC DEVELOPMENT

There is one feature of all periods of trade depression which should not be overlooked, and that is that opportunity is given for technical and scientific investigation and development not possible under stress of great production and the endeavor to turn out a maximum amount of work. That this is being taken advantage of in England today is evidenced by the work of Diesel engine builders and also by the movement to introduce standardization of ship machinery and fittings.

There can be no doubt of the eventual revival of the world's shipping business and that Great Britain will have her share in this revival goes without saying.

Its shipping is necessary to the existence of the British Empire and that this ship-

ping will be maintained at all costs cannot be doubted, even though the revival and future development are in the face of more serious competition than has heretofore existed.

TO COOPERATE WITH DEPARTMENT OF COMMERCE.—With a view to establishing an effective point of contact between associations interested in the merchant marine and the Department of Commerce as to lighthouse, steamboat inspection, coast survey and navigation questions, a committee has been appointed to represent the associations.

American Marine Congress Adopts Resolutions Outlining Constructive Policy for Merchant Marine

Consolidates Views of One Hundred National Organizations into Shipping Program for Guidance of National Legislators—Plans Permanent Organization

THE Marine Congress which assembled at the Waldorf Astoria Hotel in New York City on November 8 at the invitation of the American Marine Association to work out a practical plan for the development of the American merchant marine was attended by representatives of about one hundred organizations directly or remotely interested in transportation by water. Col. E. A. Simmons, chairman of the Central Committee, presided and in his opening remarks told his hearers how warmly the late President Harding had supported the movement and read the letter from President Coolidge reproduced on this page showing the appreciation of the Administration for the efforts which the Marine Congress is making for the development of American shipping.

After extended deliberation the Marine Congress adopted twenty-two resolutions outlining a constructive policy for American shipping. The resolutions reflect the general opinion that the merchant marine should be privately owned and operated and that the Government should retire from active participation in the operation of mercantile vessels. Furthermore, the universal wish was expressed that the potential menace of a large and uneconomical fleet of idle vessels should be removed, and that the Government should immediately dispose of the large number of its vessels which have no value as competitive units.

The resolutions adopted were as follows:

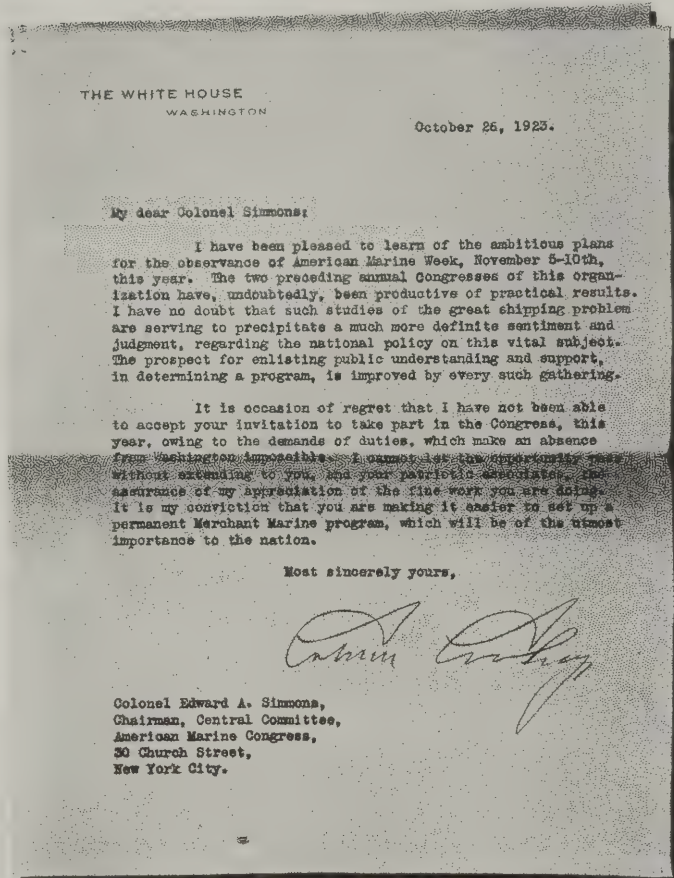
RESOLUTION No. 1

Part A. Resolved that the United States Shipping Board and Emergency Fleet Corporation should retire from the business of operating ships, and place the operation in private hands, at the earliest practicable date.

Part B. Resolved that the United States Shipping Board should immediately scrap such vessels as are inferior in design, equipment or condition.

Part C. Resolved that the Shipping Board should offer its remaining vessels for sale to American citizens without any restrictions, and without discrimination between buyers and ports.

Part D. Resolved that after the lapse of a reasonable time all of the vessels not sold under the foregoing plan and having no immediate prospective sale value, should be scrapped.



President Coolidge's Letter to Marine Congress

Part E. Resolved that there are some freight and passenger and mail services maintained by Shipping Board vessels, the continuance of which may be considered as essential to our national interests. If the Shipping Board is unable to find buyers for the vessels in such services, they should be placed in private hands under an operating arrangement until buyers can be found or developed or the impossibility of profitable operation be definitely established.

RESOLUTION No. 2

Resolved that American shipping should be conducted by private American owners and that all merchant ships owned by the Government should be transferred as rapidly as possible to private ownership. Under no condition should government owned lines compete with private lines but, if for the purpose of expanding our trade, new lines are established by the Government, they should be as rapidly as

possible transferred to private ownership.

RESOLUTION No. 3

Resolved that the Secretary of Commerce and the United States Shipping Board be requested to proceed to have the navigation laws of the United States modernized, codified and made comparable with those of our successful maritime competitors.

RESOLUTION No. 4

Resolved that the unparalleled success which has attended the reserving to American ships of first our own mainland commerce and that of our commerce with Alaska, Porto Rico and Hawaii, justifies and demands the prompt extension of that national policy to our own commerce with the Philippines.

RESOLUTION No. 5

Resolved that we urge the adoption of a national policy reserving the transportation of not less than one-half of the total number of immigrants admitted to the United States in any fiscal year to vessels registered or enrolled and licensed under the laws of the United States.

RESOLUTION No. 6

Resolved that we favor the enrollment under suitable regu-

lations as to pay, qualifications and duties of officers and men of the Merchant Marine in the Naval Reserve of the United States.

RESOLUTION No. 7

Resolved that we favor the carriage of governmental officials and employees and supplies by privately-owned American ships and the restriction of ocean travel by government officials and employees to American ships when available.

RESOLUTION No. 8

Resolved that we heartily approve the enlightened policy of the Post Office Department under the Merchant Marine Act of 1920, and that we strongly urge the Department to continue to transmit the mails by American steamers whenever this can be accomplished with the least possible delay.

RESOLUTION No. 9

Resolved that the rail and ocean transportation media be drawn together and made to function as one transportation system to all parts of the world; and be it further

Resolved that permission be given to railroads and American steamship lines to enter into cooperative agreements to divide their said joint rates in a manner similar to that universally pursued in the division of rates on domestic and traffic via Canada; and be it further

Resolved that such arrangement shall not be permitted with respect to American railroads and foreign steamship lines.

RESOLUTION No. 10

Resolved that an earnest effort be made on the part of the Administration to amend existing treaties with a view of the establishment of preferential customs duties on goods carried by American ships and tonnage dues paid by American ships.

RESOLUTION No. 11

Resolved that a system of preferential rail rates for goods and passengers carried in American ships be made effective.

RESOLUTION No. 12

Resolved that we adopt the policy of allowing our railroads to apply export rates on materials used in the construction of American ships and on supplies used therein.

RESOLUTION No. 13

Resolved that it is essential to the permanence of the American merchant marine that American ships be properly built, manned, equipped and operated, and that all equipment and appurtenances be kept at a high state of efficiency and that the cargoes carried be properly loaded, safely carried and delivered; it is recommended that a proper uniform load line law be enacted, and it is further recommended that all American vessels be classified in the American Bureau of Shipping; and that loading of cargo be inspected by the Board of Underwriters and a loading certificate be obtained in the case of vessels engaged in overseas trade, and that the vessels be insured in the American Marine Insurance Syndicates, and that in the event of any loss or damage the services of these associations be immediately availed of.

RESOLUTION No. 14

Resolved that the National Congress repeal all laws that admit foreign-built ships, including yachts, to American registry, and eliminate the 10 percent excise tax on pleasure boats built in this country.

RESOLUTION No. 15

Resolved that the practice of placing contracts for repairs to government (other than naval) vessels on a basis of estimated cost without guarantee, in competition with bids of private interests, is unfair and should be discontinued.

RESOLUTION No. 16

Resolved that the chairman of the United States Shipping Board be requested to have prepared and cause to be released as public information a report of the recent survey of its idle or other tonnage suitable for conversion into vessels equipped with oil engines, and to include therein a fairly comprehensive statement of physical condition of such vessels. That the Construction Loan Fund established by the Merchant Marine Act of 1920 be made available for loans for the conversion of suitable government owned steam vessels to motor vessels and for equipping them with such new auxiliaries as this conversion would necessitate. That purchasers entering into agreement for such conversion shall be enabled to borrow, from the fund named in above paragraph, to an amount not exceeding two-thirds of the cost of complete conversion under the same terms and conditions as are now provided for in case of new construction. Such costs of conversion to include shipyard charges for installation and necessary repairs and alterations to hull as well as the costs of main engines and auxiliaries, while the remaining one-third of all such costs are to be borne by the purchasers.

That the government be encouraged to continue to sell such vessels for such conversion under the most advantageous terms to the purchaser.

RESOLUTION No. 17

Resolved that the Congress strongly endorse the movement for elimination of waste and simplification of practice initiated by the United States Department of Commerce, the American Marine Association, the United States Shipping Board Emergency Fleet Corporation and the representatives of the marine industries and the organization by them of the American Marine Standards Committee.

That the American Marine Standards Committee be commended to the interests in the marine field, for their encouragement and support, as a proper organization to point the way to needed economy in the design, construction and operation of ships and port facilities and allied industries, and one which, if properly encouraged and supported, can accomplish much to lessen the economic handicap with which our Merchant Marine is at present hampered and also to promote the construction of American ships in American shipyards.

RESOLUTION No. 18

Whereas a comparison of area and population of Europe as a whole and the United States discloses that although of similar area and commerce the United States has comparatively few well developed ocean and inland waterway ports while Europe has many, serving every section of its coasts and interior, and

Whereas the inevitable growth of the population and commerce of the United States will require many well equipped ocean gateways, therefore

Be it resolved that it is the consensus of opinion of the American Marine Congress that the development of an adequate number of ports be encouraged and that to that end equitable ocean and rail class and commodity rates for exports, imports, coastwise and intercoastal trade to and from such ports on an equitable basis be established and maintained.

RESOLUTION No. 19

Resolved that all bureaus of the Department of Commerce having to do with merchant marine affairs be consolidated under one head within the Department of Commerce.

RESOLUTION No. 20

Resolved that American citizens who travel abroad for business or pleasure, individually and collectively, including business and professional associations taking part in foreign

conventions, athletic teams, merchants and manufacturers who ship to and receive goods from foreign countries and all other American citizens who travel and ship by sea should consider themselves bound by patriotic duty to patronize American ships.

RESOLUTION NO. 21

Resolved that in view of the fact that liquor smugglers can readily transfer their present registry from the British to the French or Panaman or other foreign flags, and in view of the fact that most liquor smugglers at the present time are accustomed to anchor more than 12 miles off shore, and in view of the fact that the proposed treaty with Great Britain will give British passenger ships an advantage over all other ships including American, we earnestly urge the Senate of the United States in the interests of fair play to American shipping, to reject the proposed 12-mile treaty with the British Government.

RESOLUTION NO. 22

Whereas undoubtedly the American Marine Congress is especially interested in all matters pertaining to shipping, and therefore is vitally concerned with our export trade which

makes such shipping possible, they have therefore a vital point of contact with all other organizations interested in promoting foreign trade, and should cooperate to the fullest extent with these associations and with the proper governmental departments. We appreciate the force of public thought that may be created at such meetings as this, and the influence that discussions at the sessions and the resolutions that may be adopted by the Resolutions Committee play in the affairs of the nation. Much good can be done in co-operating with the various associations that have made this Congress possible and can assure you that this committee, having been appointed by the American Manufacturers' Export Association, will do all in its power to bring to the attention of that association any resolutions adopted by your Resolutions Committee for such investigation, study and recommendations as apply specifically to the purposes of their organization, which is—to *foster foreign trade*.

Be it therefore resolved, That the present Central Committee of the American Marine Congress take immediate steps to make permanent this first American Marine Congress, in accordance with the expressed desire and general thought expressed in its session.

A Remedy Proposed for the Shipbuilding Situation*

By Joseph W. Powell†

IN the years before the war our principal shipyards depended on naval contracts for the back log of their shipbuilding. The Limitation of Armament Conference definitely closed our naval expansion for years to come. The United States Shipping Board holds for sale a vast fleet of tankers, cargo vessels and passenger boats, and until this fleet is disposed of, the building of new vessels, except of special types, is rendered nigh impossible. Three years of falling freight rates and short cargoes have left few shipping companies in financial position to buy new tonnage even if they had the desire. In time, high railroad freights will act to increase water transportation in coastwise and intercoastal trade and will some day place these services on a remunerative basis. In the growth of this trade our shipbuilders can hope for a reasonable volume of orders. At present, the million gross tons of intercoastal shipping is not carrying full cargoes, but five years from now I believe two or three times this tonnage will find lucrative occupation on this route. This should mean a quarter of a million gross tons of new ships annually in this trade alone. Besides the Shipping Board's enormous fleet, there are on the ocean over six million gross tons of American flag ships. Beyond the new tonnage for intercoastal service this private fleet should purchase 300,000 tons per annum for its upkeep and expansion. So, once through the present depression, shipyards should be able to count on a building program of about 450,000 gross tons a year. To be optimistic, let us double this total which should take care of any building to meet favorable shipping laws that may be enacted, as well as all other causes.

What does such a program as this mean in terms of present building capacity? Barring another war, it is a fair prediction that as at present organized this industry cannot operate at 40 percent in any one year in the next five. This means excessive costs made worse by cut-throat competition. It means for many yards a process of starvation and eventual extermination. A shipyard is a difficult property to operate for any other business purpose than shipbuilding. Uses

may be found for boiler and machine shops. Steel shops may be employed in car building, and miscellaneous work for foundries, pattern shops and pipe and sheet iron shops may be found as makeshifts to reduce losses from idleness. But, at best, these shops are ill adapted to any special work except that for which they were designed, nor do these outside jobs go well with shipbuilding endeavors.

This gloomy picture is of little avail, if there is no remedy to offer. Shipbuilders cannot go far in making more new shipbuilding business, but they can control within reason the business that is offering. They cannot hope to fully employ their total capacity, but they can reduce this capacity. When the Harriman interests found that their two shipyards could not be kept half full, they made one of the most constructive moves since the war, by accepting the drastic expedient of shutting up completely one of the yards and concentrating their work at the other. If the present yards are to operate independently, there is little hope of the concerted action necessary to improve present conditions. Too many divergent factors enter the problem. But if several large combinations of principal builders could be effected, the first step towards a solution would have been accomplished. With a large majority of the industry in, say, three combined companies, these combinations should shut down and dismantle the proportion of their building capacity, the most important move in righting an impossible situation. Then by exchange of estimates of cost on all new work *before* bids are submitted and exchange of *actual cost* on completed work, bid prices could be brought within reasonable limits and the present disgraceful competition stopped.

I do not underestimate the difficulty of carrying through this proposal. Closed yards mean lost positions, and it would be beyond human nature to meet such proposal free from bias. The difficulty of adjusting values and agreeing to any combination can be magnified by want of belief in the proposed remedy, and many other good reasons can be advanced against any drastic action. But the cold facts of the situation still endure and, if my analysis is nearly correct, lead to one end. We shall await with deepest interest the solution to this problem.

* From an address delivered at the annual banquet of the Society of Naval Architects and Marine Engineers in New York, November 9.

† Former president, United States Shipping Board, Emergency Fleet Corporation.

An Adequate Merchant Marine Essential for the Nation*

The Future Greatness of the United States Depends Upon Increasing Her Commerce with the Outside World

By Rear Admiral Charles P. Plunkett, U. S. N.**

THE immediate problem which we face is not the building and supporting of a merchant shipping so much as it is a problem how to deal with what we now possess. Based on thorough information, the present seems to be a period of too much uncertainty and no probable future. It is not contended that the American people do not want a merchant marine. They not only want it, but their Congress has taken some of the steps necessary to provide it, and the policy which they have approved would provide for a suitable merchant marine. Unfortunately, there are features of that policy that would lead to endless embarrassment; namely, the denouncing of some of our treaties and the modification or cancellation of others.

The policy of direct and indirect aid to merchant shipping is not new. It has been applied by all nations, and is still being used by the majority. The application of it at this time is a question which we must consider. Nobody yet has accused the American people of trying to get something for nothing, but, undoubtedly, there are a great many people who, in discussing the question of the merchant marine and in refusing to give it the same consideration that we have given to other means of transportation which have been developed in the country, seem to think that the merchant marine can be brought to life and kept going on a profitable basis without any expenditure or contribution on the part of all the American people.

FAILURES HAVE DEMONSTRATED DIFFICULTIES OF THE PROBLEM

Undoubtedly, many private individuals have sunk their last dollar in an effort to demonstrate their capability to operate ships with little or no outside assistance. These efforts have only demonstrated the public spirit of these individuals, and their failure has not caused any great amount of comment among the great mass of the people, who seem to applaud only the successful. But these men have been successful for our purpose, for they have demonstrated the difficulties of the problem of placing upon the seven seas an American merchant marine, consisting of American-built ships, manned by American citizens, and carrying the products of American industry, all under the American flag! President Harding, in his address to a joint session of the Senate and House of Representatives on February 28, 1922, offered a perfectly feasible and proper plan to save our merchant marine.

Who can look back only as far as 1914 and not realize the immense importance of a nation's potential strength and resources in a proper merchant marine? Who can look back to 1917 and not realize the helplessness of the greatest nation on the face of the earth when confronted by a demand for help? Not help that you had all the time in the world to provide, even supposing you had all the money that you needed, but help that was needed instantly and in quantity.

Who does not believe today that, unless America gets behind her merchant marine, the elements combined with other features will reduce to a state of helplessness that with which we found ourselves possessed at the end of the Great War? What is to become of our building and repair yards? Just suppose they have to go out of their present

business. How long will it take to gather the necessary technical and operating forces to again produce and maintain shipping?

No one in America is predicting war, but everyone in America is thinking of a greater America! Upon what lasting, peaceful basis can America ever be greater, except through the increase of her commerce with the outside world? And upon what basis can she derive that greatness except through the ownership of a merchant marine capable of handling at least fifty percent of that commerce in order to keep down the exorbitant and excessive rates which would certainly follow foreign domination of our sea-borne commerce, not to mention the thousand-and-one little discriminations in trade all over the world, all of which react against the American producer and farmer?

MERCHANT SHIPPING IS MORE THAN A SECOND LINE OF DEFENSE

We of the Navy can operate away from the coast of the United States just as far as the American merchant marine can support us, and no farther. If the Navy is our first line of defense, then the merchant marine is so near to it that it is not entirely a second line of defense! It is so nearly in the trenches with the Navy that it can hardly be called a second line of defense.

Nobody begrudges the other nations the success which they have attained in ocean-borne commerce, but the American is not an American who idly sits by and sees his business carried on by other nations in a manner and after a style dictated by our industrial and agricultural competitors.

There is no reason, except utmost emergency, which should warrant an American citizen to take passage for any port in the world on other than American vessels, nor should there be any reason why more than half of the ocean-borne commerce of this country should travel under any other but the American flag!

The time element is the most expensive element entering into human life. No one should ever work on a basis that they have plenty of time. It is entirely reasonable to use adequate time where a big decision is to be made, but the American people have decided that they want an American merchant marine—the decision in this case has been made. Are we to allow the time element to absolutely and utterly destroy that which is absolutely essential that America can maintain herself in security in time of peace and also in time of war?

BANKERS' COMMITTEE ON MARINE SECURITIES.—Recommendations that the government should retire from the shipping business as soon as possible without interfering with existing needs of trade, and that the La Follette seamen's act and other laws which tend to increase the cost of ship operation should be modified, were contained in the report of the committee on marine securities adopted at the annual meeting of the Investment Bankers' Association held at Washington on October 31. The committee also expressed the opinion that a definite statement of policy should be made by the Shipping Board that it will remove government competition on any essential trade route which will be taken over by private interests. The committee believes ways and means must be found to finance the shipping business conservatively.

*From an address delivered at the Marine Congress Banquet at the Waldorf-Astoria Hotel, New York, November 8.

**Commandant of the Third Naval District, New York Navy Yard, Brooklyn, N. Y.

EXHIBITS AT THE MARINE EXPOSITION



General View, Main Aisle, Marine Exposition

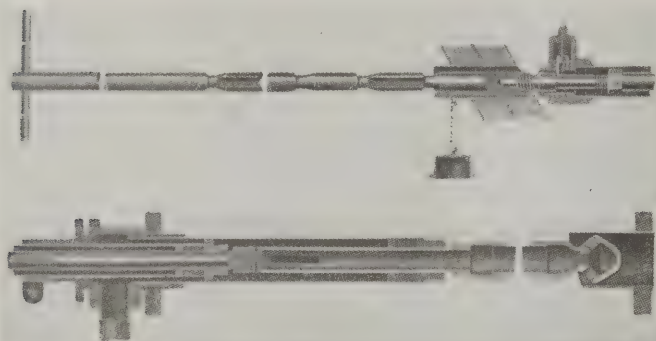
New and Interesting—

devices shown for the first time at the annual Marine Exposition, held at the Grand Central Palace, New York, November 5 to 10 under the auspices of the American Marine Association, are illustrated and described in the following pages, together with views of many of the exhibits at the Exposition. As indicated by the large number of new products displayed and the great variety of exhibits, the Marine Exposition this year marked a notable period of progress in the marine industries and reflected in no uncertain way the growing interest of the nation in maritime affairs.

EXHIBITS AT THE MARINE EXPOSITION

Rear End Front-Operated Soot Blower

A SOOT blower of the Diamond type, designed especially for cleaning the rear end of Scotch marine boiler tubes and operated from the front, was shown at the booth of the Diamond Power Specialty Company, Detroit, Mich. The principle of cleaning Scotch boiler tubes by these blowers is to blow the soot with the draft up the stack.



Cross Section Type BBM Diamond Soot Blower

It was specially developed for double end Scotch boilers or for a single end boiler so close to a bulkhead as to prevent the installation of the rear end type blower.

The model BBM blower may be installed in boiler tubes of 2-inch inside diameter and larger. It is housed in the boiler tube proper, the units nearest the center of the tube bank being selected where possible. Operation is by means of a removable handle, which passes through the uptake doors and engages a simple mechanism, which permits the blower to be advanced through its enclosing tube back into the combustion chamber, step by step, at the same time being rotated about its horizontal axis. Through the combination of these two motions, the steam jets describe constantly-widening cones which clear the tube surfaces. After blowing, the blower is drawn back into its protecting tube by a straight pull and the operating handle is detached.

Automatic Feed Water Regulator

THE Babcock & Wilcox Company, New York City, demonstrated a new type of patent automatic feed water regulator at the exposition this year. It is claimed that by reason of its free circulation and the comparatively large amount of water it contains, the B. & W. watertube boiler requires generally little attention to keep a constant water level, and in vessels of the mercantile marine in which these boilers have been fitted, feed water regulators are frequently dispensed with. In large installations of boilers, however, it is preferable to fit them.

The new regulator designed for this service consists of a hollow cylinder, which is rotated on its axis by means of a float and lever placed inside the boiler. The cylinder has ports cut diagonally along its walls, and works in a liner having corresponding ports. The liner is fitted in a casting or box which is attached to the boiler shell, and has one branch for a feed check valve, and another branch for a pipe

leading to a non-return feed valve located on the boiler drum.

The cylinder is moved lengthways along the liner by means of a suitable adjusting screw and spindle, the spindle being connected to the cylinder by ball bearings, so that friction is reduced to a minimum.

Attached to the spindle, between the adjusting wheel and the gland, is a lever and rod, the latter extending to a position in the stokehold, where it can be easily worked by hand from the firing level.

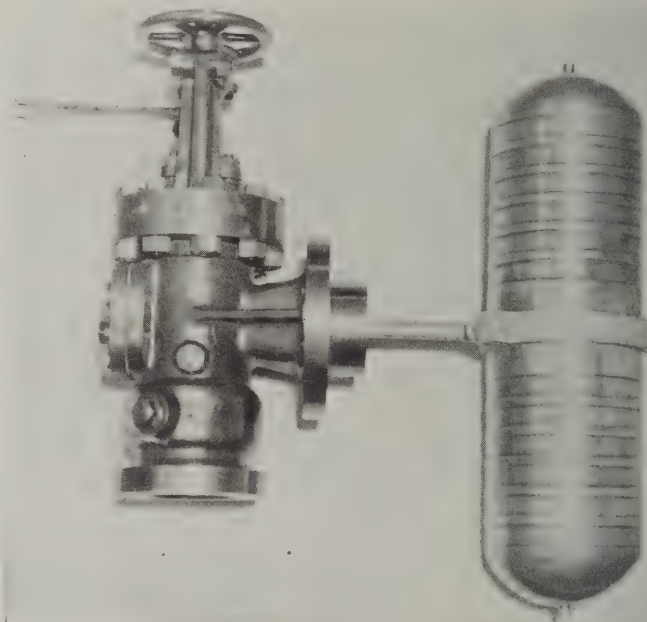
The action of the apparatus is as follows:

OPERATION

The feed water enters by the feed check valve into the hollow cylinder, and, if the water in the drum is low, passes through the ports of both cylinder and liner to the valve box, whence it travels through the pipe and non-return valve into the boiler.

The position of the cylindrical valve is entirely regulated by the float in the boiler. When the level of the water in the boiler is low, the ports will be open, and as the water rises in the boiler and carries the float with it, the cylindrical valve will be moved around, and the ports gradually closed.

The height of the level of the water in the boiler can be maintained at the position desired by moving the cylinder lengthways along the liner. This is done by turning the

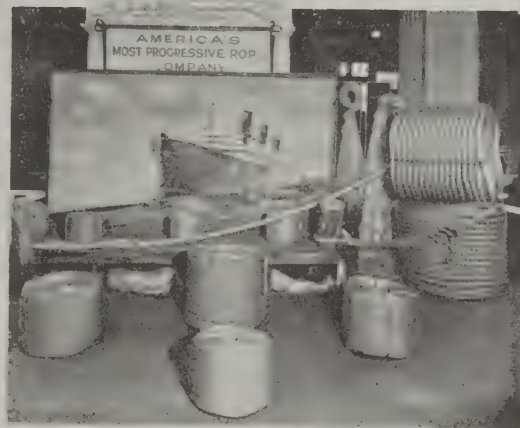


Assembly of Feed Water Regulator

hand-wheel of the spindle attached to the cylinder, the travel of which, as the ports in both cylinder and liner are placed diagonally, will ensure an alteration in the point of cut-off relative to the position of the float.

There is a suitable indicator on the adjusting wheel showing which way it should be revolved for the higher or lower water level, and there is also an indicator on the spindle itself showing when the valve is at the highest, lowest, or any intermediate position.

EXHIBITS AT THE MARINE EXPOSITION



EXHIBITS AT THE MARINE EXPOSITION

Improved Connecting Shackle

THE National Malleable Castings Company, Cleveland, Ohio, had on display an improved type of connecting shackle having the general design of a standard stud link. It is an ingenious device and can be used either in regular service or as a repair link.

Improved types of connecting shackles which are narrower in width than the old type, resulting in easier operation over the wildcat were also on exhibit.

New Asphalt Decking

THE James Coffey Engineering Corporation, New York City showed a section of "Minralite" Mastic flooring in its booth. This material is a high grade rock asphalt mastic combination of natural asphalt, refined and brought to the work in barrels, heated in specially constructed kettles and reinforced with mineral aggregate of various sizes, and carefully selected and graded.

This mix is then heated to the proper temperature and laid on the foundation which is to receive the mastic material.

It is stated that the method of laying "Minralite" Mastic and the preparation of the surface on which it is to be laid has been brought to a high state of perfection through actual practice and years of contracting and observation of the material in service.

The thickness of this floor depends upon the service required.

The features of this mastic as stressed by the company are that it is a preventative against corrosion; that it prolongs the life of the plates; and that the cost of maintenance is reduced.

Static and Dynamic Balancing

THE Vibrator Specialty Company of Philadelphia, co-operated with the Akimoff Propeller Company in demonstrating the combination static and dynamic balancing machine at the exposition. A 24-inch diameter bronze propeller was mounted and the method of operation explained. The machine can be instantly set for static or dynamic balancing and gives, as the company states, results of greatest accuracy. It gives the plane and the amount of correction to be applied to the body to make it operate smoothly *i.e.*, in short vibrations. Machines of this type find wide application in industrial plants to accurately balance crankshafts, fly-wheels, propellers, armatures, pulleys, etc.

Larger machines for balancing turbines and rotating fields, weighing up to 15,000 pounds are manufactured by the Vibration Specialty Company.

Not long ago the Vibration Specialty Company balanced five turbo-generators of the S. S. *Leviathan*. The portability of the machines made it possible to bring them into the turbo-generator compartment of the ship. Results were secured which exceeded all expectations.

The Akimoff Propeller Company also exhibited models of propellers built entirely along the lines of the circulation theory. These propellers look very much like any other but are developed on a radically different basis tending as it is claimed to unusually high efficiency.

Automatic Control for Cargo Winches

IN the General Electric Company exhibit at the recent Marine Show at the Grand Central Palace were included three pieces of apparatus of especial interest. These were a magnetic winch control, a portable, electric air compressor and a 500-watt turbine-generator.

All the electrical equipment for a single cargo winch installation was included in the magnetic winch control. This consisted of a General Electric type COM waterproof motor, with shoe type load brake especially designed for mounting on the open deck of a vessel where occasional submersion is to be encountered; a master controller of watertight construction, and a magnetic panel with accelerating contactors, overload protection and resistors mounted back of the panel. The panel was of the open type for mounting in a protected place.

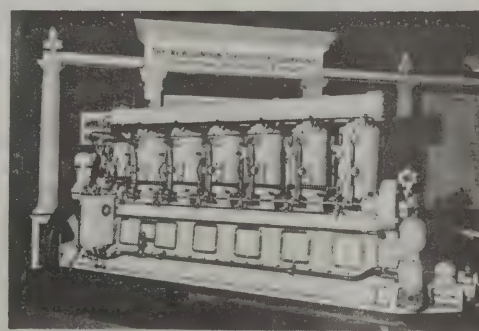
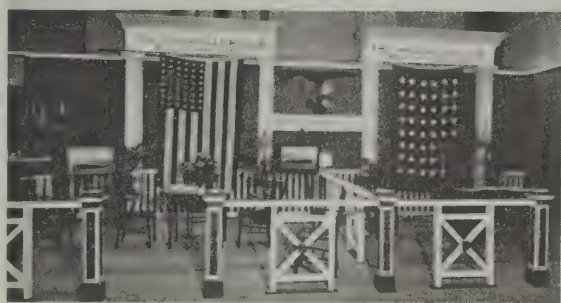
This magnetic control is of strong construction, and is simply operated. It is superior to the drum controller handling motor currents due to the fact that the automatic contactors allow for the time element required in accelerating or decelerating motor speeds. The handle on the magnetic control can be moved easily and rapidly, whereas, on the drum controller, this operation must be done more slowly to definite points to prevent any possible burning of control fingers and segments and to allow an even movement of load.

An emergency switch is provided with this control, placed close to the operating handle. By means of this, the winch can be stopped in any position, the load brake set and the current cut off the motor.

The portable air compressor which was on exhibit is a compact, electric motor-driven machine to work from three to five standard pneumatic tools at once. With this device holes may be drilled up to 1½ inches in steel, seams may be beaded and calked and steel may be shaped by chipping. The greatest use on electrically equipped vessels would be in blowing and cleaning dirt or dust from the windings of electrical machinery, ordinarily inaccessible for hand cleaning. Another use is found in scaling surfaces preparatory to repainting. The motor takes three horsepower when charging the reservoir and is automatically governed to maintain the pressure between narrow limits. This unit will compress 35 cubic feet of free air per minute to 90 pounds gage pressure.

The CY 32-C turbine-generator shown by the General Electric Company at this exhibit is adaptable for providing current for various illumination purposes on tugboats and other small craft and as an auxiliary unit on larger vessels. It has a rating of 500 watts at 32 volts and operates at 3,600 revolutions per minute. The turbine, which is of the non-condensing type, has a special form of governor. A self-contained pressure regulator maintains a constant nozzle pressure with boiler pressures varying from 125 to 225 pounds or 70 to 170 pounds. The generator in turn maintains a constant load on the turbine by means of an eddy current brake coil which automatically compensates for any change in electrical load. The elimination of the usual type of mechanical governor simplifies the design so that there are but fifty separate essential parts in the entire machine and but one adjustment, that of the tension of the spring in the pressure regulator.

EXHIBITS AT THE MARINE EXPOSITION



EXHIBITS AT THE MARINE EXPOSITION

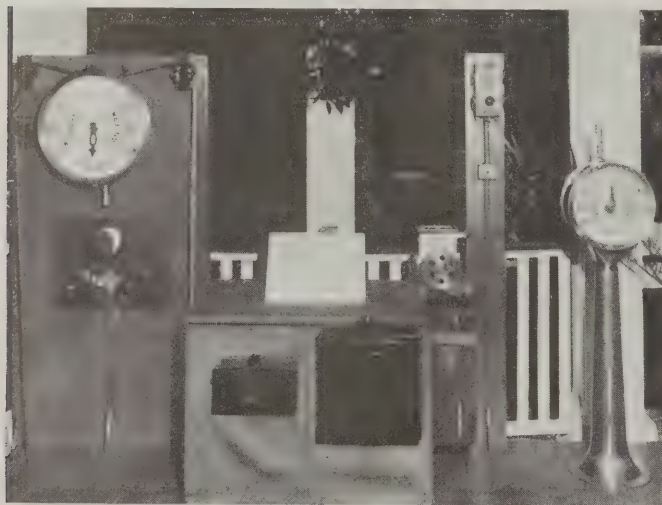
American Brass Company Has New Lead Covered Cable

THE American Brass Company, Waterbury, Conn., recently purchased the National Conduit and Cable Company, Hastings-on-the-Hudson, New York. This company is now known as the Hastings-on-the-Hudson branch of the American Brass Company. The principal new product being handled by the American Brass Company, made possible through this purchase, is lead-covered copper cable of many varieties used for power transmission service.

Bethlehem Corporation Producing Plant Mills Direction Indicator

THE Bethlehem Shipbuilding Corporation, Ltd., demonstrated the Plant Mills direction indicator and engineer's alarm at its booth this year. The rights for the manufacture of this device have been taken up by the Bethlehem people, who are manufacturing it at present at the Union Plant, Alameda, Cal.

This device is used as an aid and safeguard in maneuvering vessels at close quarters. The direction indicator keeps the navigator wherever he is on the bridge constantly informed as to the handling of the engines and the engineer's



Plant Mills Direction Indicator Demonstrated at Marine Exposition

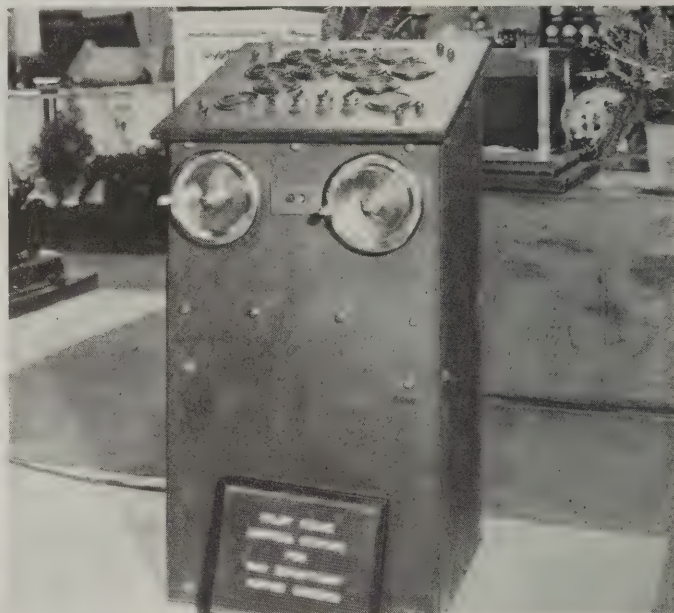
alarm provides a prompt and efficient means whereby the engineer is instantly and automatically warned should he fail to operate the engines in accordance with directions from the bridge.

The bridge indicator, visible from any part of the bridge, shows the speed and direction of the engines; a white light flashes from three upper lenses for every revolution ahead and a red light flashes from three lower lenses for every revolution astern.

By means of flashing red lights and alarm bell in the engine room, the engineer is warned of an error in answering the bridge signals, the alarm operating until the error is rectified. Parallel wiring is used throughout the system.

Control Station for Dredge

THE Westinghouse Electric & Manufacturing Company exhibited the pilot house control station and the corresponding engine room main control panel which will be used for controlling the two 800 horsepower propelling motors on one of the four new 5,000-ton Diesel electric sea-



Pilot House Control for Army Dredge

going hopper dredges now being built for the United States Engineer Department.

By means of two hand wheels on the bridge control pedestal the pilot has complete individual control of the two propelling motors. It is claimed that this is a great advantage on a ship which has to do a great deal of maneuvering. The control pedestal also carries instruments showing propeller revolutions and the load on the motors.

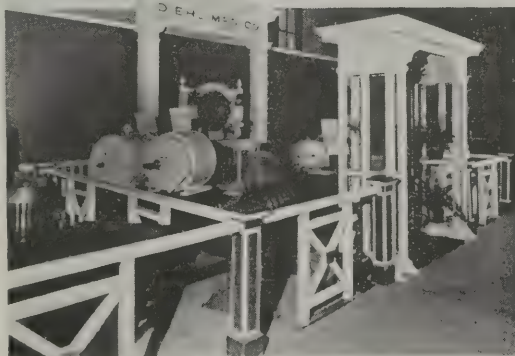
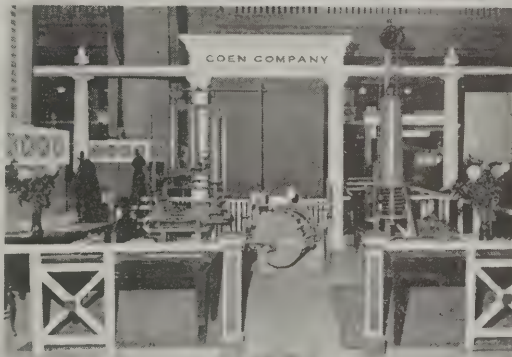
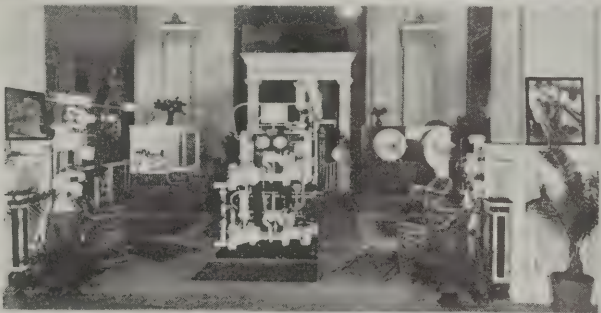
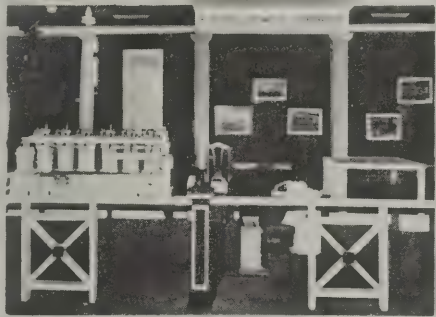
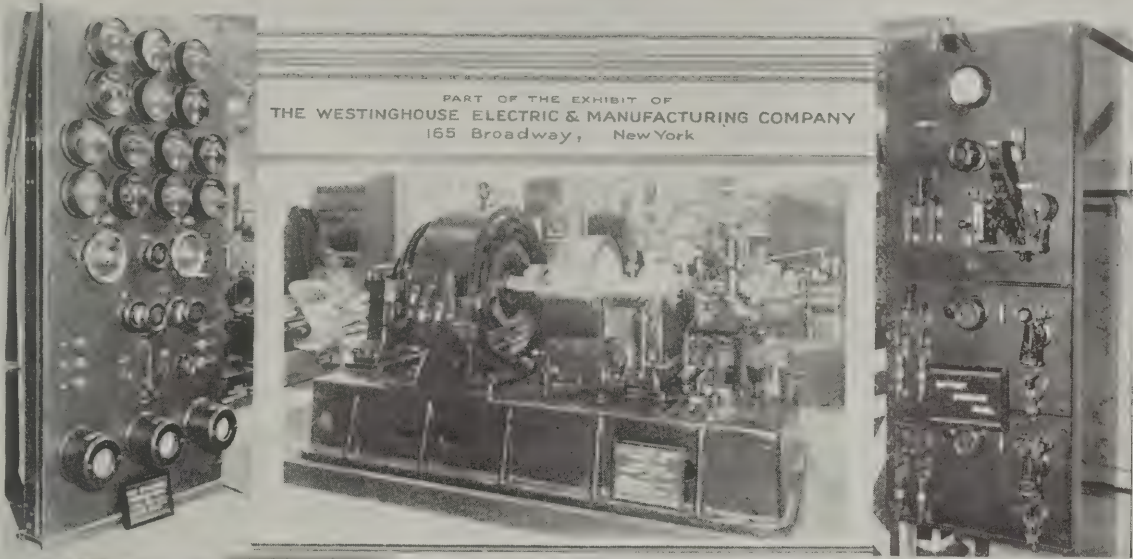
Similar equipment is mounted on the engine room panel, together with a transfer switch by means of which the control may be connected to the bridge station or to the engine room station. The installation is illustrated and described in the "Westinghouse Marine Log" now being distributed in the Westinghouse booth.

Novel Gyrating Electric Ceiling Fan

THE Diehl Manufacturing Company, New York City, is seeking an appropriate name for a novel type of gyrating ceiling fan which was shown at the entrance of booth No. 31 at the Marine Show.

The fan motor was mounted in a ceiling base and supported by ball bearing pivots in such a manner that the motor is free to swing in any direction on the principle of a universal joint. The motor itself also has ball bearings and means are provided to prevent grease or oil from escaping at the lower end. The motor shaft extends downward and carries a 6-blade fan wheel, which may be either 12 inches or

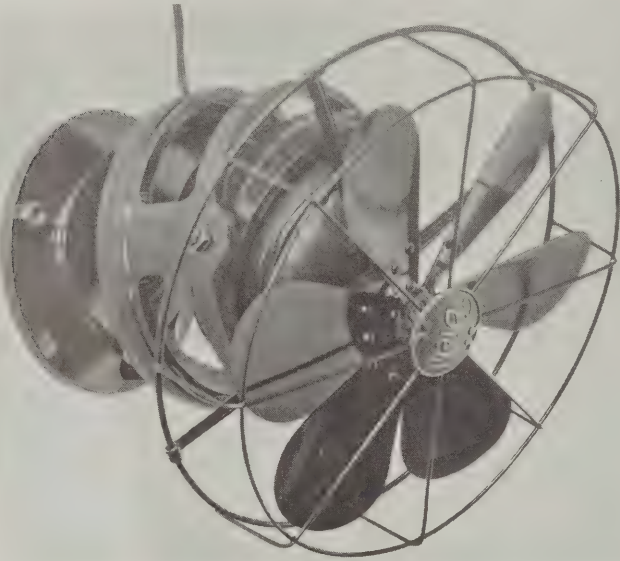
EXHIBITS AT THE MARINE EXPOSITION



EXHIBITS AT THE MARINE EXPOSITION

16 inches in diameter. The blade is protected by a suitable guard. At the upper end the shaft is connected through a reducing gear to a lever which is attached to the base by a ball and socket joint. The gear reduction is such that when the fan is running at normal speed the lever causes the motor body and fan blades to gyrate at about 6 revolutions per minute. During this gyration the motor shaft always remains at

demands of owners for a range that would use inexpensive oils safely and with cleanliness. It is stated that the oil burner part of the equipment is of simple construction and requires little more attention than the burner on the ordinary domestic oil stove. The oil is fed to the burner by gravity, no mechanical aid being necessary for either atomizing the oil or for furnishing air to the burner.



New Diehl Gyration Fan

a fixed angle of about 30 degrees to the vertical axis. This angle may be varied to suit local conditions by changing the length of the driving lever at the top.

The fan thus throws a cone of air, with the apex of the cone at the center of the motor. This feature has suggested the names "Aerocone" and "Conovair."

Arc Welder for Ship Work and New Galley Range

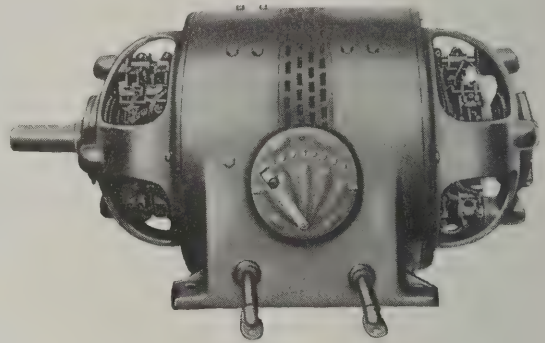
THE Todd Shipyards Corporation in its exhibit showed the Todd twin-pole arc welder which has been developed especially for use on board ship where it comes into service in the repair of leaky seams, fire cracks, leaky pipe joints, worn machinery parts, loose or broken rivets and other essential repairs that can be made by welding.

The Todd welder has been designed for quick work and its small size and weight, it is said, particularly adapt it for ship service. It is 28½ inches in overall length and driven from any plant generating 110 volts direct current or from other similar sources of power supply. It is readily portable and designed for a single operator.

The Todd representatives are calling the welder to the particular attention of shipowners and operators.

NEW GALLEY RANGE

Another feature of the Todd exhibit was a new type oil burning galley range which has been developed to meet the

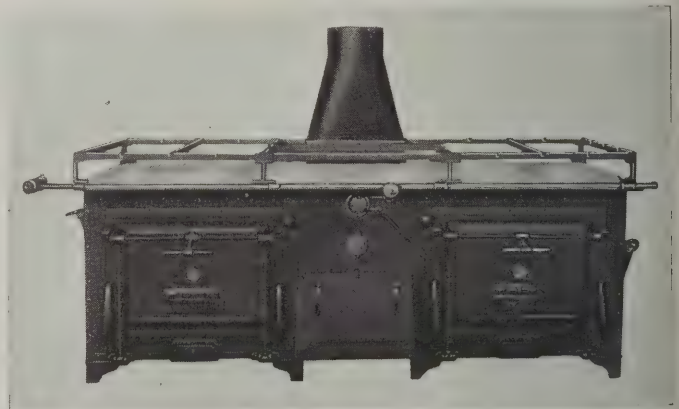


Ship Type Arc Welding Unit

The burner is placed in the center of the range with flues to right and left around the ovens, permitting even regulation of the temperature of the ovens. The oil supply line to the burner on the front of the stove is equipped with a sight feed oil box, in which the flow of oil can be observed.

The range is built of blue annealed mild steel of the highest grade and it is stated will withstand rust, corrosion, hard usage and wear. Castings are of the best grade of gray iron. All exposed sides are insulated with genuine asbestos mill board.

It is fitted with one firebox and two ovens, the range measures 98½ inches in length, 26 inches in depth and

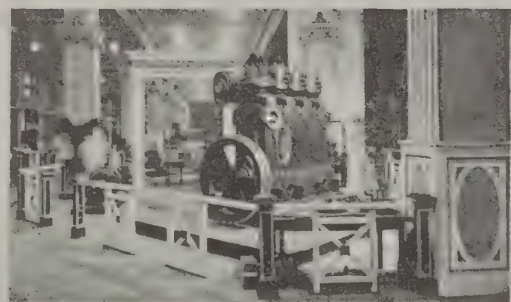
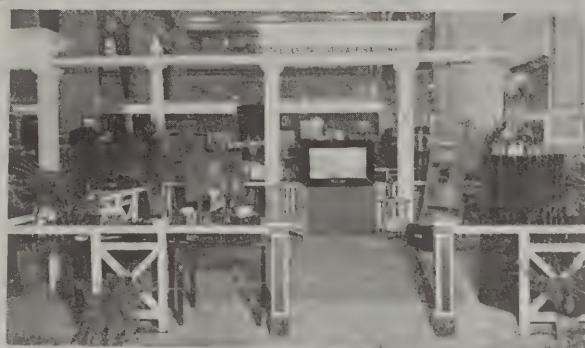
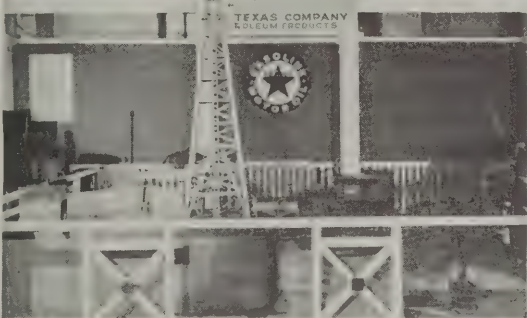
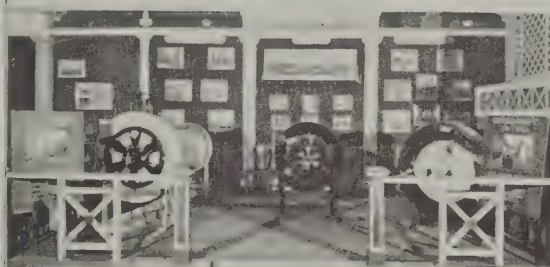
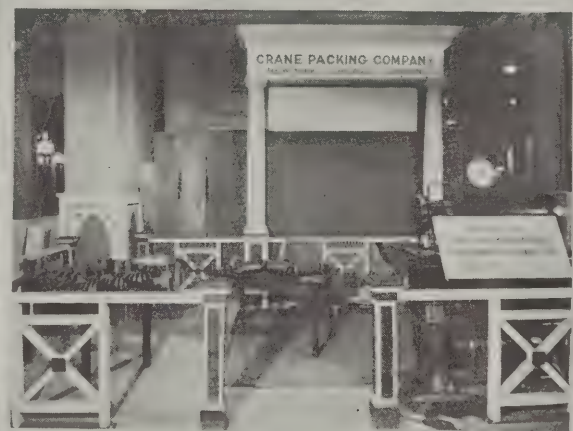
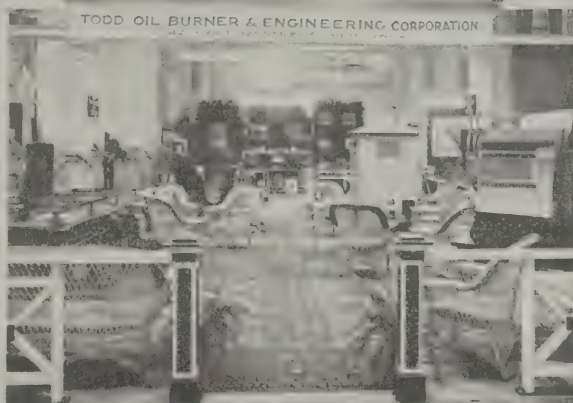
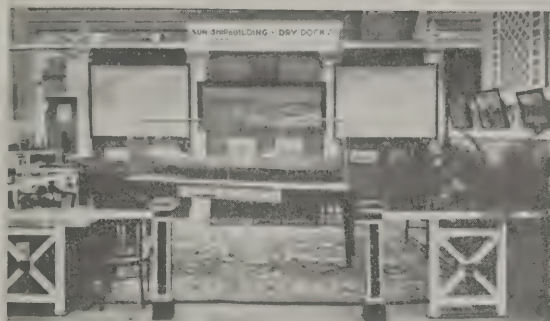


New Oil Burning Galley Range

stands 36 inches high. Its design permits it to be taken apart in five distinct units, handled through a small door and reassembled inside the galley.

The top of the range is made of cast iron, ¾ inch thick on the ends, increasing to a thickness of 1½ inches in the center. Heat will not warp it. The top is polished for use as a grill and is fitted with a gutter completely surrounding the edge of the top to catch the drippings from overflowing.

EXHIBITS AT THE MARINE EXPOSITION



EXHIBITS AT THE MARINE EXPOSITION

This eliminates danger from fire and makes for cleanliness. Adjustable and interchangeable sea rails are also fitted.

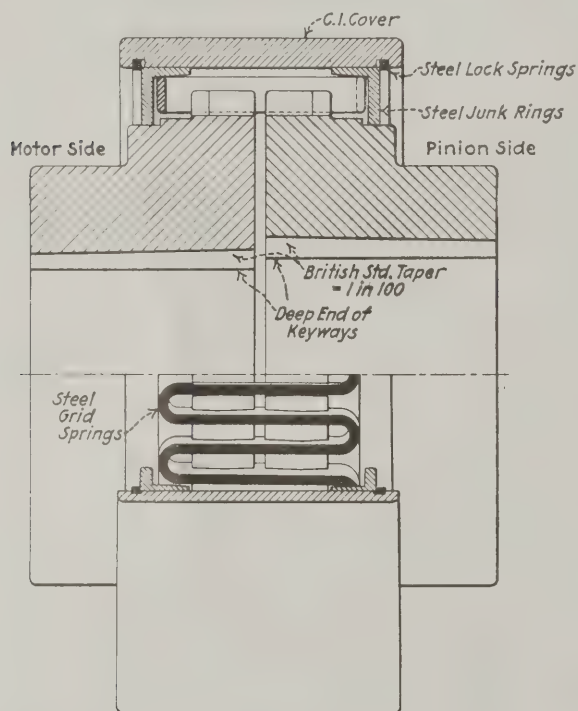
The ovens are of large size, 18 inches by 26 inches by 25 inches, equipped with doors of extra heavy construction, counterbalanced and with protected springs. Door handles are designed to permit the doors being left open one inch for light cooking.

Large flues have been provided around the ovens and a specially designed by-pass damper cuts out the flues, permitting a direct passage from the burner to the stack. This permits the range to be quickly started up.

Bibby Flexible Couplings Manufactured by Falk Corporation

THE Falk Corporation, Milwaukee, Wis., had on exhibit for the first time a flexible coupling invented by James Bibby and manufactured in England by the Wellman-Bibby Company. The Falk Corporation has acquired the exclusive manufacturing rights in the United States of

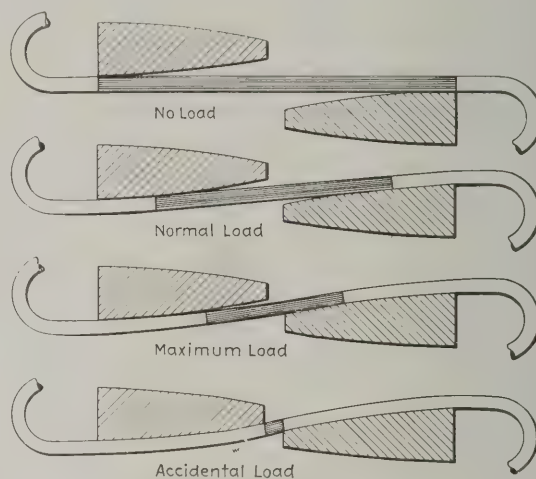
ing of the grooves is in the form of an arc of definite radius and is produced by machines specially designed for the manufacture of these couplings. The radius of the arc bears a definite relationship to the thickness of the spring bars and is designed so that when each bar is bent around this radius the stress in the spring cannot exceed a fixed safe value. Under light and normal loads, there is a long free span of spring between the points of support on the



Sketch of Falk-Bibby Flexible Coupling

the Bibby patents and has equipped its plant with a full line of very ingenious special machinery for manufacturing its couplings to take care of requirements in this country. The coupling will be known as the Falk-Bibby coupling.

This coupling consists of two flanged steel disks (one keyed to each shaft), two or more sequents of a tempered steel spring forming a continuous cylindrical grid, and a steel cover. On the periphery of the flanges are pitched cross grooves in which the spring is placed. The spring is the flexible member and its shape, and that of the grooves, forms the characteristic feature of the coupling. The grooves in the disk widen inward toward each other, so that the spring fits closely in them only at their outer ends. This widen-



Action of Spring Under Variations of Load

two flanges, which allows for considerable flexibility, but under heavy overloads the spring members become supported along the sides of the grooves thereby automatically shortening the span and stiffening the spring.

It is stated that the coupling will compensate for want of alinement of the shafts without setting up cross pulls as occur with belt type couplings. The amount of eccentricity which the coupling will accommodate is more than that caused by worn bearings before they require relining.

The flexibility of the coupling was demonstrated by a remarkable exhibit at the Exposition. A centrifugal pump was mounted on a tank, and driven through a Falk-Bibby coupling by a 5 horsepower motor. This motor was mounted on a plate which in turn was swung sideways so that during the operation of the pump at full load the centerline of the motor shaft was slowly swung sideways up to 10 degrees each way out of alinement with the pump shaft. In spite of this tremendous misalignment the set ran very quietly.

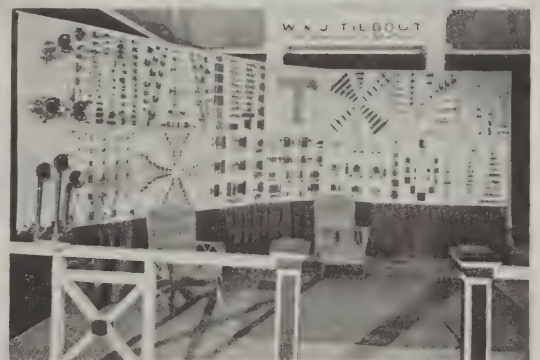
The Falk Corporation claims for the coupling a torsional resiliency which enables it to smooth out bad running conditions.

Improved Sash Balance

THE O. M. Edwards Company, Inc., Syracuse, N. Y., had on exhibition an improved marine sash balance. This device is designed to balance plate glass windows, especially those used on enclosed promenade decks of passenger ships.

The balance is made of bronze to provide against the action of salt water and is mounted away from the deck, so that water will not accumulate around it. It is stated that simplicity and the small number of movable parts add to the efficiency of this device. The entire device is of brass with

EXHIBITS AT THE MARINE EXPOSITION



EXHIBITS AT THE MARINE EXPOSITION

the exception of a steel coiled spring, which provides tension for the balance. This spring is inclosed in a brass cylinder packed with grease.

Tests of the device on the *S. S. President Harding*, under all conditions of weather, have demonstrated its merits.

Temperature Indicator for Cold Storage Compartments

THE marine electric thermometer which has been developed by the Wilson-Maeulen Company, 383 Concord avenue, New York, for many years manufacturers of a high grade of electric thermometers and pyrometers, was demonstrated at the exposition.

This thermometer is an apparatus with which the temperature of a number of stations can be determined within the

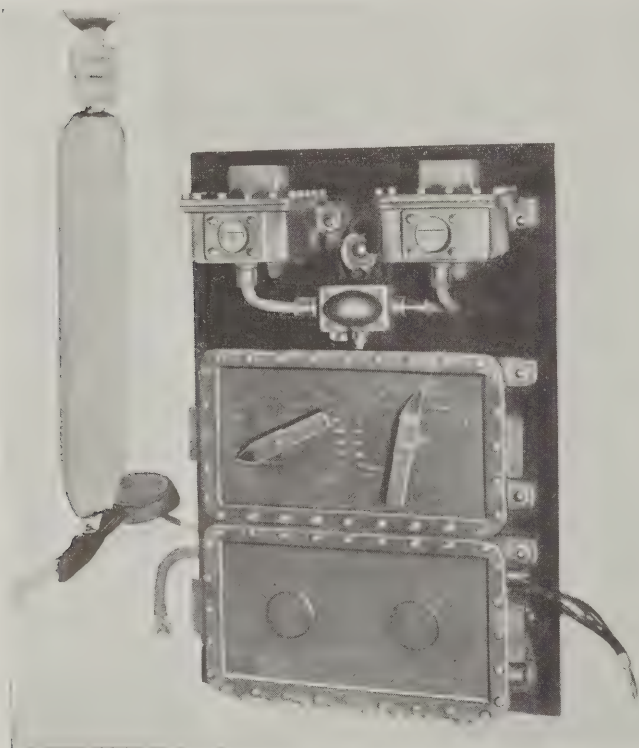
anism is mounted under the cover in a box casting of marine bronze; operating spindles of Monel metal extending through stuffing tubes to the indicating dials on the front. Connecting wires from the mechanism compartment pass through a stuffing gland at the lower side of the case and enter the upper side of the separate junction box casting where the electric connections are made to the cable from the thermometer bulbs. The galvanometer indicators are fitted in individual marine bronze cases. The scale window is of thick plate glass suitably protected.

These indicators respond to less than one-tenth of one degree F. change in temperature of the thermometer bulb and are necessarily sensitive. The galvanometer indicators are of the moving coil type and are built with only one pivot which is located at the geometric center of the coil and which is also at the center of gravity of the movement. This feature renders the indicator readings practically independent of mechanical vibration and of ship roll.

To operate, turn the station selector switch to the desired temperature point (each point being indicated by a positive click). Turn the temperature dial until the galvanometer indicator index deflects to its zero. The number at which the temperature dial then points, indicates the temperature of that particular bulb.

Salinity Meters

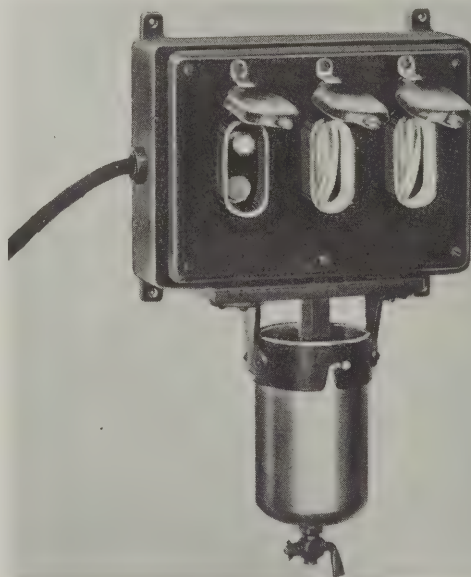
NEW equipment developed by the Brown Instrument Company, Philadelphia, Pa., to detect surface condenser leakage, evaporator priming and boiler water salinity was shown at the Exposition.



Electric Marine Temperature Indicator for Refrigerated Spaces

cold storage range. The apparatus comprises two dials, the one a temperature dial reading from 10 to 60 degrees F. and the other a station selector switch of 30 points. These two dials are mounted on a suitable panel and below them is a junction box. Two galvanometer indicators are mounted above the two dials, one being a spare. A separate waterproof switch is thrown to connect either indicator into the circuit.

Any number of electric thermometer bulbs (up to 30 maximum) may be located at suitable points where temperature is to be measured. Each thermometer bulb is connected to the indicator panel with a continuous armored cable. The temperature indicating dial and station selector switch mech-



Lamp Type Salinity Meter

It is claimed that this salinity detector, which is of the lamp type, eliminates the difficulties experienced with former designs of the lamp type. In this indicator the supply circuit feeds two parallel paths. Two lamps alike in characteristics are used in the circuit as visual indicators in the following manner:

EXHIBITS AT THE MARINE EXPOSITION

A cell is connected in series with one lamp while the second lamp is connected in series with a variable resistance.

It will be understood that if this resistance is adjusted so as to be equal to the resistance between the cell electrodes for a given concentration of salt in the water, the lamps will burn with equal brilliancy and be affected alike by line voltage. Consequently the observer's eye is provided with a standard for comparison, thus eliminating the personal equation and errors due to voltage variations.

Another feature incorporated in the lamp-meter is the provision for automatic temperature compensation. Temperature

the eddy currents generated in the disc. The torque in one direction is controlled by the current flow through the water surrounding the electrodes. Consequently it depends upon salinity of the water under test. The torque in the other direction is fixed and depends upon the current flow through a resistance. This resistance is so adjusted as to be equivalent to the resistance between electrodes at a definite salinity. Then, if the salinity of the water under test exceeds this predetermined value the disc will rotate and close a contact in the alarm or signal light circuit. If the salinity should be lower than the predetermined value the torque controlled by the fixed resistance will predominate and the meter disc will rotate in the opposite direction.

Automatic temperature compensation is secured by varying the resistance in response to temperature changes. The instrument, it is claimed, is practically free from voltage and frequency errors in that the circuit is differential and essentially equivalent to that of the Wheatstone Bridge. Vibration has very little effect on the meter because of the absence of fragile suspensions. The moderate accuracy, ruggedness and low cost make this instrument particularly suitable for marine service. Its construction renders it practically moistureproof. The compact form is also of advantage for installations under conditions where very little space is available. Alternating current is necessary for operation of this meter.

Combined Fire Detecting and Extinguishing System

A COMPLETE installation of the combined Lux-Rich System for detecting and extinguishing marine fires as it will be fitted on the motorships *Challenger* and *William Penn* was shown at the booth of Walter Kidde and Company, New York City, distributors for the system.

Another feature of the exhibit of this company this year was an electro-vapor radiator the American rights for which are controlled by the Walter Kidde and Company. The staterooms of the new Southern Pacific passenger ship being built at the Tacoma, Washington, yard of the Todd Shipyards Corporation will be fitted with these radiators.

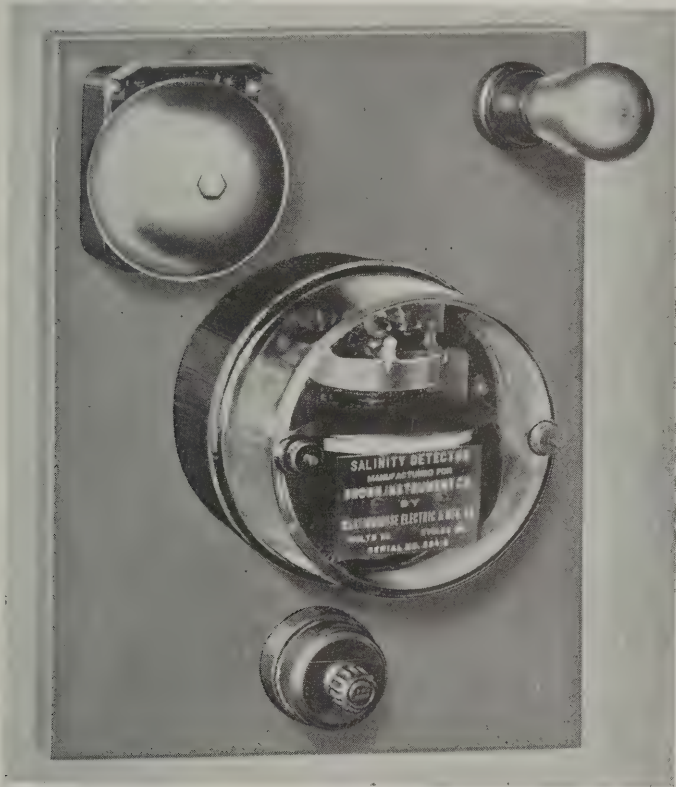
New Developments in Fire Detecting Wire

A NEW feature in the exhibit of the Fire Detecting Wire Corporation, New York City, was their waterproof thermostatic wire. This company's wire was first developed for shore use, and the outer insulation was made of varnished cambric. Although this wire was moisture-resisting to a degree, it was not entirely suited to the severe conditions encountered at sea.

For this reason a waterproof wire was developed which it is claimed has successfully met the rigorous conditions of marine service.

A wall of uncured rubber was substituted for the varnished cambric. Tests made daily on samples submerged in salt water for long periods show this wire to be unaffected in any way.

An installation of 6,000 feet made in a ship last April is giving entire satisfaction.



Salinity Detector with Alarm Features

variations, if uncorrected, will produce substantial errors. For instance, if a sample of water at 150 degrees F. is tested with an instrument calibrated at 120 degrees F., an error of approximately 30 percent in the resistance will be introduced. To compensate for these errors the electrodes are so arranged as to move further apart as the temperature increases, thus producing an increase of resistance to balance the decrease due to the rise in temperature.

INDUCTION TYPE SALINITY INDICATOR

This meter was developed to meet the need for a rugged salinity indicator. The instrument, alarm bell, signal lamp and switch being mounted on a panel. The automatic alarm feature is of great value, in that it will instantly warn the operating engineer if condenser leakage or evaporator priming result in excessive salinity of the boiler feed.

The principle of operation is similar to that of the watt-hour meter. A light aluminum disc, running in jewel bearings, is rotated between laminated magnetic pole pieces by

Stream-Line Filters

ONE of the most interesting exhibits at the Shipping Exhibition recently held at Olympia, London, was the stream-line filter. This remarkable apparatus has attracted widespread attention in Great Britain and a company, known as the Streamline Filter Corporation, has recently been formed in New York with Mr. F. D. Herbert as president for its production in this country.

The stream-line filter is the invention of Dr. H. S. Hele-Shaw, the eminent British scientist and was described by him in a paper read at a meeting of the London Section of the Society of Chemical Industry in June, 1923, as follows:

In a paper presented recently to the Royal Society the author explained that he had in the course of certain experiments with thin films found that not only was it possible to separate the very finest matter in suspension from a fluid, but

even apparently to separate two fluids of different densities if the film were sufficiently attenuated. For the purpose of doing this he employed a fibrous or textile material impervious to the action of the fluid itself. The material employed was a form of water-proof paper.

It is important to show how it is that the stream-line filter of comparatively small size is able to deal with large quantities of fluid at moderate cost.

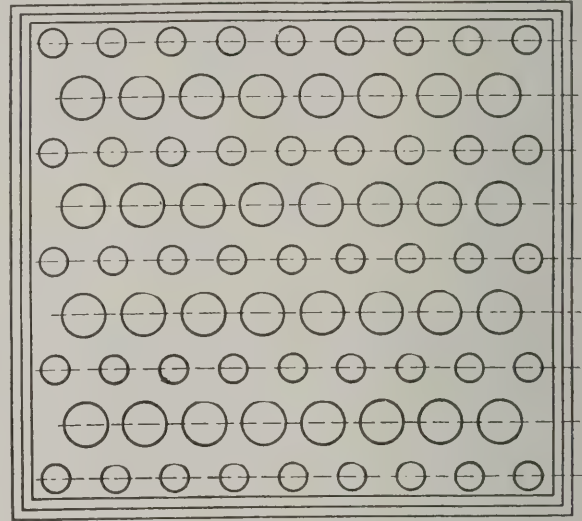
The essential points of the

Single Unit, Vertical Type Stream-Line Filter

stream-line filter are the employment of one or more packs of impervious material, preferably paper, on account of its lightness and cheapness, the pack being held between two ends called pressheads; also means of controlling the pressure according to the filtration required. With the view to economy the sheets in the pack are cut rectangular in form, and with a view of getting as large a filter surface as possible for what may be known as edge filtration as opposed to surface filtration, each sheet is perforated with an identical number of holes in such a way that the holes lie in alternate rows of large and small holes. When the sheets are put together in a pack (as in the case of the filter shown to the meeting, 4,000 or 5,000 sheets) the holes form tubes. If into one row of tubes the prefilter, or liquid to be filtered, is forced under pressure from the pressure head and the opposite ends of the tubes remain closed, there is no escape for the liquid except through the interstices of the sheets. The liquid passes through these interstices, leaving behind the matter in suspension in what may be called the inlet tubes, and passes down the smaller or outlet tubes. In the language of hydrodynamics, each large inlet hole in the sheet thus becomes a "source," and each outlet or smaller hole becomes a "sink." It is obvious that the area of filtration is represented by the area of the inner sur-

face of the larger cylindrical tubes, which is why these tubes are made larger. The smaller tubes are quite sufficient to discharge the filtrate.

By degrees a film is formed on the inner surface of the larger tubes, consisting of particles which are unable to pass between the sheets, and are thus filtered out from the general



Arrangement of Perforations in Sheets of Stream-Line Filter

body of the liquid to be filtered. Now there are obviously two important functions of the filter, one being that in which the object is to recover the liquid which has passed through the sheets in a purified condition, as, for instance, the case of filtration of water or oil, the suspended matter being dirt or impurity of some kind which has to be removed; in the majority of such cases removal of the impurity or dirt can be effected by opening up the larger tubes and washing through with the prefiltrate or fluid to be filtered. The other case is much more difficult, being that in which the solid matter left behind, or residuum or "depot," which may be solid or a viscous fluid, is the valuable material of which recovery is sought. In this case the washing out is never easy to effect, and is very often impossible, or at any rate impracticable. One mode of removing the material is by rods, in which case the

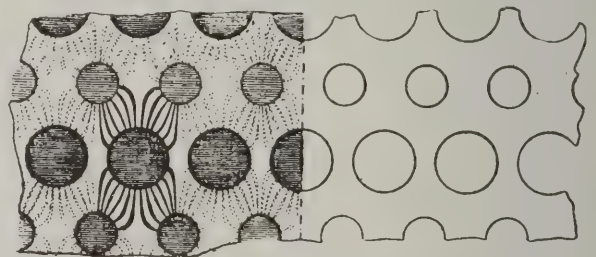


Diagram Showing Stream-Line Flow

filter is generally required to be opened. Other methods are under consideration and trial, but the object to be aimed at is undoubtedly to effect clearance of the solid matter in the way that the washable dirt is at present collected—namely, without opening up the filter, and if possible without employing such mechanical devices as involve the use of bevel wheels or spiral drums, actuated by external machinery, and requiring packing glands in the filter itself.

By putting a large number of packs together in rows, it is quite easy to see that as the operation of washing out the inlet tubes is a matter of, at most, a few seconds, it is possible to have continuous action, and only one pack at a time need be put out of action for washing. Suppose, for example,

(Continued on page 770)

Naval Architects' Meeting a Feature of Marine Week

Society of Naval Architects and Marine Engineers Discusses Economic and Practical Phases of Merchant Ship Construction and Operation

THE thirty-first general meeting of the Society of Naval Architects and Marine Engineers was held at the Engineering Societies Building, 29 West 39th street, New York City, on November 8 and 9, with President W. M. McFarland in the chair. Immediately following the opening of the meeting the secretary read the annual report. He commented at some length upon the loss in membership that had taken place after the peak membership attained during the war, but said that the gain in the past year had been quite as much as was expected and that a considerable part of the loss during that same period was due to elimination of members for non-payment of dues which had been too long delayed. The growth of the endowment funds was in good condition and steadily increasing.

Abstract of President's Address

There is an aspect of this period of depression on the side of personnel which is very serious and filled with danger to the profession. The dull times have thrown many highly experienced men out of employment and they have been forced to take up other lines. This is also true to some extent with consulting naval architects and engineers.

FIRST NATIONAL MARINE CONGRESS

At this time, in this city, there is in session the first National Marine Congress, in which our Society is represented and which is an effort to bring together all who are interested in the prosperity of the American Merchant Marine. The interests represented are not only ship owners and operators and ship and machinery builders, but exporters, manufacturers in general and the farmers. Thus it appears that an earnest effort has been made to bring together representatives of our whole people in the hope that by conference and discussion some scheme can be evolved which will meet with general approval and can be presented to Congress as representing the wishes of the nation.

VESSELS FOR COASTWISE SERVICE

What I have said with respect to the terrible depression in shipbuilding applies particularly to vessels for foreign trade. There is, however, a silver lining to the cloud when we think of vessels for the coastwise service and for our bays, lakes and rivers. For this service 36 vessels of 143,669 gross tons have been built in American yards from January 1 to November 1, 1923.

Orders have been placed for a number of large vessels on the Lakes. The Southern Pacific Company has recently placed an order for a large, thoroughly modern passenger and freight steamer for their line from New York to New Orleans, and two Eastern coastwise companies have placed orders for two vessels each which will be thoroughly modern in every way. It is also stated on good authority that a prominent shipping company on the Pacific Coast is about to place the order for a large, high speed passenger and freight steamer for service to the Hawaiian Islands. Other projects are under consideration and may materialize very shortly. All of these will mean work for our shipyards and give an encouraging aspect to prospects for shipbuilding.

With respect to the general survey of marine conditions, for large power houses on shore the tendency seems to be a very material increase in steam pressure and in the amount of superheat carried, so that there are a number of installations carrying 350 pounds pressure, a few that have gone as high as 600 pounds, and a few small plants have been built

for 1,200 pounds pressure to see what trouble will develop. The demand for economy in the production of power is so great that these large installations are neglecting no detail which will contribute to that end. It seems probable, if the experience with these higher pressures on land is satisfactory, that it will have an influence on the design of machinery for vessels, and undoubtedly our leading designers are studying this movement very carefully so as to be prepared at the proper time to bring out designs which will represent the latest steps in progress.

ELECTION OF OFFICERS

The following officers whose terms expired December 31, 1923, were re-elected:

Vice-Presidents: Homer L. Ferguson, Frank L. DuBosque, Henry A. Magoun, William A. Dobson.

Council Members: (Representing Members of the Society): Herbert C. Sadler, William H. Todd, Daniel H. Cox, Ernest H. Rigg, Charles F. Bailey, William McEntee. (Representing Associates): Herbert L. Aldrich, W. L. Marvin, M. D. Ferris.

Executive Committee: Walter M. McFarland, ex-officio; Stevenson Taylor, Frank L. DuBosque, Washington L. Capps, Joseph W. Powell, Andrew Fletcher, Homer L. Ferguson, Daniel H. Cox, ex-officio, Alfred Gilbert Smith.

Secretary-Treasurer: Daniel H. Cox. Assistant Secretary-Treasurer, Thomas J. Kain.

Additional Notes on American Shipyard Apprenticeships, Evening Schools and Scholarships

By Chas. F. Bailey

ABSTRACT

The advancement in shipyard apprentice work and evening schools during the last two years, while considerable, is apparently not as great as the progress in some of our large manufacturing corporations. This condition is to be regretted, but it is largely explained by the fact that during this period we have been, and still are, struggling for the very existence of the shipbuilding art, principally owing to the cessation of naval construction and to the small amount of new merchant tonnage now building. Due to the above considerations some yards have made but slight advancement, while others have even reduced their apprentice training or almost entirely done away with it.

With the Newport News Shipbuilding and Dry Dock Company interest in apprentice training has increased during the last three years or more, and it is now greater than at any previous time. The character of the boys and their attitude and bearing have uniformly improved during the last three years. The establishment of scholarships has also tended to raise the character of the apprentice applicants, and they now come with a better preparation than previously.

The scholarships offered are as follows:

(b) A two-year course covering work in a number of the following subjects: Language, Mathematics, Physics, Chemistry, Metallurgy, Electricity, Marine Engineering, Naval Architecture or allied subjects in an approved university, technical school or institute.

(c) A one-year course covering similar work in several of the above subjects in an approved university, technical school or institute.

(d) A home correspondence school course in an approved

correspondence school or a course of thirty-six weeks in the Industrial Y. M. C. A. Evening Preparatory School of the city.

Candidates for scholarships are required to be American citizens and not less than seventeen nor more than twenty-one years of age. Appointments are based upon general conduct, workmanship, character and ability. Scholarships (b) and (c) are granted only to apprentices who have served approximately two years of their time. Scholarship (d) may be awarded after one year of apprenticeship.

The expenses of these scholarships are borne by the company; these expenses include fees, tuition, subsistence, books, instruments and an allowance for traveling expenses. The apprentice is required to serve in the works of the company during vacations, for which services the regular rates of pay for apprentices are in effect.

The granting of scholarships to the apprentices has not created discontent among the boys who are not thus recognized, but, on the other hand, it has had the effect to stimulate them in their efforts. Applications are numerous in a number of the trades, particularly in the electrical and machinist departments, in which there are more applications than can be accepted.

It is not a difficult thing to show an ordinary boy of ambition who is undertaking a trade that it is very honorable and creditable to become an expert mechanic in his chosen line. Such mechanics are comparatively rare, and a boy can feel great pride in knowing that his skill is such as to win commendation and single him out as of note.

Apprenticeship in foundry work has not been very popular, but an endeavor is now being made to show the excellent opportunity which this offers.

The apprentice school work is so adapted and arranged as to assist the boy in shop work, especially in drawing, mathematics, physics and chemistry. This school work is required of each boy, beginning immediately after his six months of probation and continuing for three years, excepting for the summer vacations. Each boy is required to attend two sessions of three hours each, weekly. The time spent in this school work counts on his apprenticeship and is paid for at the regular apprentice rate to which he is entitled.

The correspondence scholarships are especially adapted to young apprentices, as they entail night study, which is no hardship for a boy working eight hours physically, or only five hours during the days on which his school session comes.

The interest of the boys in shop work and school work at the yard is such that, when necessarily left to carry on in the absence of the instructor, they do this without disorder or lack of application. The apprentices have adopted a Constitution of Apprentice Government for the purpose of promoting a helpful feeling toward each other, an apprentice spirit, the business interests of the apprentices and the attainment of greater opportunities for future apprentices of the company. The working body of this organization is the Apprentice Council, composed of ten active representatives elected from departments or groups of departments in the yard. An honor system has been adopted by the apprentice body. This is an innovation among the apprentices, but it promises to function admirably.

Evening schools are conducted under the educational director of the Young Men's Christian Association. An Educational Committee composed of influential men of the town and officials of the yard meet monthly to advise and assist in the work.

An Apprentice Athletic Association, with annual dues of five dollars, handles the athletic activities of the boys. The dues are budgeted to the various sports. The supervisor and his assistants handle the receipts and disbursements. Championship teams in basketball, baseball and football are arranged. During this season the football schedule calls for games with high schools, colleges and with one college

varsity team. No games other than with school teams are scheduled. Stress is laid on clean sportsmanship which is recognized by the various schools with which games have been played.

A band of several pieces has been organized and a glee club has been formed. A bulletin is issued each week to which the apprentices contribute news items of events of interest.

We believe that the organizing of apprenticeships in trades, with scholarships and night schools, can be successfully handled by any yard and become a paying investment in addition to training up young men of character, who will become useful, contented, influential, service-giving citizens; but this means that the owner, a responsible part of the management and many others in the organization must take a heartfelt interest in the young men. It cannot otherwise be done successfully.

DISCUSSION

This paper was discussed at some length by President McFarland, by Hugo P. Frear, whose discussion of the paper was read by Captain Linnard, by Professor Sadler and by Homer L. Ferguson, president of the Newport News Shipping and Dry Dock Company. Mr. Ferguson made mention of the great improvements, in his opinion, of training the apprentice in athletics as an adjunct to their shop training and as being one of the most important parts of the whole system.

W. M. McFARLAND, president of the Society: I have read Mr. Bailey's paper with a great deal of interest and pleasure. It is the kind of paper that I believe will be productive of great good and he deserves our thanks for presenting us with such valuable information. I am very much struck with the incentive offered to the boys by the provision for courses in technical schools and elsewhere at the expense of the company. I regard this feature of the plan, as outlined by Mr. Bailey, as of the utmost importance. I am also greatly pleased to notice the stress he lays on the honorable and creditable standing of the highly skilled mechanic. The paper is so full of good points that to comment on everyone of them would almost amount to writing another paper, and I will refrain from further remarks except to state again what a pleasure it has been to read the paper and my desire that Mr. Bailey should understand our thorough appreciation.

HUGO P. FREAR, naval architect, Bethlehem Shipbuilding Corporation, Ltd.: There is no one connected with shipyard operation who does not appreciate how valuable an asset the right kind of apprentices are. It cannot be disputed that they have a direct and positive influence in lowering the cost of production besides providing man capital to draw on in the future.

Comments on Aviation—Naval and Commercial

By Captain E. S. Land (C.C.), U. S. N.

ABSTRACT

Naval aviation has been aptly termed "the eyes of the fleet." It is needless to add that any arm of any service is very severely handicapped, if not entirely incapacitated, when it does not have proper eyes to carry on its maneuvers, be they peaceful or militant.

Since the armistice there has been a relatively great change in naval aeronautics. During the war every effort was made to produce aircraft for countersubmarine work and for convoy and patrol duty. This led to the development of large flying boats and non-rigid airships. These types now exist in a fairly satisfactory state of perfection, and attention has been diverted from them to the development of aircraft suitable

for use with the fleet. Fleet aviation requires small and handy combat planes of high performance to be carried with the fleet; planes for scouting, observation, and spotting gun-fire; and torpedo and bombing planes for offensive use against an enemy fleet. The development of these types has been pushed vigorously, and there are actually in existence and in operation today a number of designs which give great promise of fulfilling the needs of the fleet.

Simultaneously with the development of special aircraft for fleet work, the problem of carrying these planes with the fleet has received consideration. In home waters, large flying boats working from harbors and bases on shore have proved serviceable, but in order to carry planes with the fleet, it is necessary either to carry the planes on regular ships of the fleet or on special aircraft carriers. This requires that fleet aircraft be small and compact. It has not only been proven possible but also entirely practicable to launch planes by means of catapults; but it is not yet practicable to provide sufficient deck space for planes to return again to the regular ships of the fleet. This requires that these planes must either be designed as seaplanes to alight on the water or they must alight on the flush deck of an airplane carrier.

Successful efforts have been made during the year to develop a suitable fighting plane for the fleet which is small enough to be handled by ships.

As to spotting and observation planes, experience in the battle and scouting fleets has furnished sufficient information to proceed with the construction and delivery of several types which should fulfill the requirements of the fleet.

The development of a suitable torpedo plane has proven extremely difficult in view of the necessity for obtaining a small and compact plane which will, nevertheless, carry the standard torpedo. Five different types of experimental torpedo planes have been constructed, and several of these types have been tested out not only by the Navy Trial Board but also by the service.

The Bureau of Aeronautics has followed the policy of encouraging design and invention outside the Naval Service, but has taken great care to maintain a sufficiently expert design staff so that the Navy would never be entirely dependent upon or forced to accept only such designs as might be submitted by contractors. In the same way, while the procurement of aircraft is normally handled by contract after competitive bidding, the war showed the necessity for controlling the production of a portion of the Navy's requirements for aircraft and the Naval Aircraft Factory was created and has been maintained in an active, but much reduced, operating status.

So far as the lighter-than-air activities are concerned, we are now on the threshold of development, tests, and trials which will indicate, not only to the United States Navy but to the world, whether or not lighter-than-air in general and rigid airships in particular have a proper place in the naval organization. Not only are the military eyes of the world concentrated on these activities, but also the commercial eyes; assuming that the results obtained by the United States Navy in connection with rigid airships are successful, there is no doubt but there will be a tremendous impetus, both from a military and from a civil point of view, in connection with the development and construction of rigid airships throughout a number of countries in Europe and probably in Japan. There is no denying the vulnerability of this type of war weapon, but at the same time it is practicable to make these ships less vulnerable than they have been heretofore.

The rigid airship operating alone might readily be compared to a battleship operating without a convoy of destroyers. The rigid airship in action would probably be convoyed by combat planes or other types of planes, depending upon the mission to be fulfilled. The great advantages of rigid airships from a military point of view are: Their great radius of action, their high speed, their ability to hover,

their ability to readily obtain great altitude, their ability to receive and transmit information, and their general long-range scouting ability, particularly with regard to coastal patrol. It is believed that they form the means par excellence of antisubmarine patrol. They probably will be the aircraft carriers of the future.

At the present time, a new standard of service acceptability has been set up—a standard which requires that each type of engine demonstrate its ability to withstand a running test of 300 hours at full throttle without any failure of such nature as would force a termination of any flight under service conditions. The work accomplished and the work under way in connection with this matter is of the utmost importance to the aerial strength of the Navy, since it goes far toward eliminating the greatest single source of weakness in our aircraft operation—that is, the delays, the uncertainties, the hazards, and the expense occasioned by power plant failures.

In order to satisfactorily "sell" aviation to the Navy, it is essential that aircraft power plants be made reliable and dependable. To an extent not paralleled in any other form of transportation, the performance and utility of aircraft are measured by the degree of excellence of the power plants available, because the power plant not only propels, but also, in the case of airplanes, is the sole means of support.

"Selling" aviation to the country will be a very simple proposition as soon as it can be reasonably shown that aviation does not involve undue risk of life and property. It is a matter of interest to note in this connection that records collected in England indicate that the greatest percentage of passengers, by nationality, who use commercial aircraft flying to and from London is American.

The greatest crying need of commercial aviation at the present time is satisfactory legislation on the statutes of the Government which would control the rules of the air, the inspection, construction, and operation of aircraft, and instruction of aircraft personnel. Commercial aviation since the end of the war has had very difficult sledding financially. There is a nucleus of commercial aviation in existence in this country which deserves the earnest support of the country. As a nation, we have always been strong to protect infant industries, and certainly there is no better way to apply this protection than to lend financial assistance to commercial aviation throughout the United States.

DISCUSSION

PROFESSOR WILLIAM HOVGAAARD, of the Massachusetts Institute of Technology: Captain Land's paper has the rare merit of giving a sober and objective description of the present status of naval aircraft and affords a good basis for judging of the capabilities of this new weapon. In spite of the conservative tone of the paper—or perhaps just because of that—one is impressed with the great possibilities of aircraft in naval warfare. In order to form an opinion of the strategic value of aircrafts, it is necessary to consider primarily long continued war service under ordinary service conditions and, in doing so, we must on the one hand reckon with an average performance of aircraft far below the optimum but, on the other hand, we are justified in assuming that airplanes will be present in future wars in vastly greater number than at present, according to the resources of the respective countries.

(1) *Limitation of Airplanes.* As pointed out by Captain Land, the power plant is yet far from reliable. Planes are very dependent on weather conditions. They are fragile and vulnerable and navigation is often difficult and uncertain. In actual war service, and considering all conditions of wind and weather, the airplane is on the average a short range and uncertain weapon as compared with destroyers and submarines.

(2) *Coastal Service.* In coast defense it is probably safe to reckon on an effective range of airplane up to about 100 miles from shore more or less according to circumstances. If a belt or lane of some 50 to 100 miles can be kept under actual surveillance of planes at all times, it will permit the coastwise trade to be carried on in relative safety and will render a close blockage practically impossible. Landing of troops in force on an enemy coast can only be carried out with any prospect of success, if it is possible to establish command of the air at the point of landing.

(3) *Operation in Narrow Seas.* The passage through straits, such as those at the entrance to the Baltic and the Black seas, will be rendered dangerous in the presence of an active enemy bordering on the coasts of such waters. It is conceivable that under certain war conditions England may be forced to direct the main traffic to India via the Cape route.

(4) *Naval Stations.* The safety of naval stations may be strongly affected, favorably or unfavorably, according to their location. Detached naval stations, such as Pearl Harbor, the Canal Zone, Aden and Singapore, distant from any possible enemy base, will gain in defensive strength, if they are well equipped with airplanes, while, on the other hand, a station situated as Malta may, under certain war conditions, become entirely unsafe as a port of refuge.

(5) *Service of Airplanes on the Ocean.* Airplanes, due to their short effective radius, cannot operate independently over the sea except in close vicinity to the coast where they have their base. In order to operate over the wide expanse of the ocean they must be carried by and based on ships. Such carriers cannot by themselves secure permanent control of the ocean or any part of it.

(6) *Conclusions.* Airplanes in the present stage of development appear to have their greatest value as a means of coastal defense, although in actions between ships they may achieve great results when used offensively. The advent of aircraft is of special benefit to the United States since this country, with a well-developed coastal air defense and a strong navy, can be made practically impregnable. It is of particular importance in the defense of Hawaii and the Canal Zone. Aircraft may also be of great benefit to the British Empire in the defense of its vast and scattered parts. As regards England herself, the insular position is an advantage in defensive warfare but the immunity from attack which could formerly be obtained by supremacy at sea is lost forever.

MASON S. CHASE, naval architect, spoke most interestingly on the commercial importance of aviation. Mr. Chase also made reference to the very vital matter of the effect of aviation upon the morale of the crews of naval vessels. Captain Westervelt and Admiral Taylor also discussed the paper and gave interesting sidelights upon it from the naval point of view.

Some Factors Affecting the Economy of Operation of the Lake Freighters

By Professor Anders Lindblad

This paper is published on page 764 of this issue.

DISCUSSION

HUGO P. FREAR: It has been recognized for many years that the bulk-cargo traffic on the Great Lakes is in a class by itself. In no other restricted territory are such vast tonnages moved. Transportation on the Great Lakes is cheaper than in any other part of the world in spite of the short season and limitation in draft. A fact that is brought out most convincingly is that each size of vessel has a certain speed which will produce the greatest return from the investment for various freight rates and coal prices.

W. W. SMITH, chief engineer, Federal Shipbuilding Company: The author's conclusion, that steam turbine and Diesel installations are not practicable in Great Lake vessels does not seem to be well founded. A properly-designed turbine installation for the larger powers should cost less and have a less fuel consumption than reciprocating engines. It would seem that turbines should not be dismissed entirely without further consideration. I also think it would be unwise to put aside the oil engine as unworthy of further consideration. It is true that many current designs of oil engines are very heavy and expensive but the oil engine is developing rapidly and the engine of the future may be very different from that of today.

REAR ADMIRAL D. W. TAYLOR, former chief constructor of the United States Navy: The paper brings out in a remarkable way the influence of the cost of power upon profits. The cost of coal is beyond the control of the naval architect but evidently the speed to be obtained and the power required to obtain it, both more or less controllable features, are important factors in the equation.

Lake freighters as they stand are handicapped in several ways with respect to speed as compared with ocean-going craft. With limitation to shallow draft, their lengths are excessive. Owing to the great lengths and low speeds of lake freighters, their speed-length ratios are very small indeed, but, in spite of their abnormal frictional powers, their residuary resistance—mainly wave making, seems rather high. The block coefficients of these vessels are very high as compared with those of sea-going craft, but this does not mean much for parallel middle body vessels of great length.

It seems that it is these slow full vessels that need most and repay best thorough experimental investigation of propulsive efficiency.

So far as I know, self-propelled model investigations for these vessels have not yet been made. A very modest expenditure for this purpose would, I am convinced, result in a further material reduction in the astonishingly cheap cost of transportation of bulk cargoes on the Great Lakes.

President McFarland also expressed appreciation of this paper as dealing with the commercial side of engineering as differentiated from the purely scientific or engineering side.

A. E. F. Robertson of the Munson Steamship Company and finally Professor Sadler also made remarks relative to the various lines of thought suggested by the paper and dwelling upon its value as a contribution to the literature of the subject treated.

Wetted Surface

By Henry H. Schulze

This paper will be published in a later issue. As published articles on the subject of wetted surface are generally an attempt to devise a fairly capable method to cover all types of vessels with the attending result that the accuracy on particular types of vessels is thereby impaired, this paper embodies a complete investigation of the subject for one particular type of vessel—a merchant cargo ship of comparatively full form.

DISCUSSION

REAR ADMIRAL D. W. TAYLOR, U. S. N.: As an ancient worker on the matter of wetted surface I want to bear testimony to the value of this paper and the great amount of work required to obtain the results of which Mr. Schulze has given us the benefit. I recall none published on wetted surface comparable with it. Accurate calculations of wetted surface are laborious and monotonous and those of us who deal with them should be grateful to the author for lightening our labors.

Professor Sadler also complimented the author on his work.

Propeller Design Based Upon Model Experiments

By Rear Admiral D. W. Taylor (C.C.),
U. S. N. (Retired)

ABSTRACT

It need hardly be said that when we utilize the results of model experiments in the design of full-sized propellers we rely primarily upon Froude's Law of Comparison, which is now generally accepted by naval architects and marine engineers. Fortunately, in dealing with propellers we find that for a given slip ratio kept constant as speed and revolutions increase, the torque and thrust both increase substantially as the square of the speed or of the revolutions, efficiency remaining unchanged. We may call this for convenience the Law of the Square. If as we increase speed with constant slip the motion of the water relative to the propeller remains the same, we know that the Law of the Square must always apply exactly. It seems hardly likely, however, that this relative motion will remain exactly the same for all speeds. In stream-line motion pressures caused by the motion of an object through the fluid vary as the square of the speed, and the velocities resulting from these pressures as the speed. But the question whether in water, where stream lines are not perfect the Law of the Square is followed sufficiently closely for practical purposes needs experimental confirmation.

It is evident from Froude's writings that he had satisfied himself of the accuracy of the Law of the Square.

Of course the Law of Comparison is quite independent of the Law of the Square. Wave-making resistance of a ship, to which the Law of Comparison applies, does not follow any such simple law. But the Law of Comparison itself cannot apply exactly. It may be stated by saying that at the same slip at speeds proportional to the square root of the ratio of linear dimensions torque and thrust of model and full-sized propeller vary as the cube of linear dimensions. But for liquids the exact Law of Comparison requires that model and full-sized propellers should work under heads proportional to linear dimensions.

This is not the case for model and propeller in practice. The model works under a head equal to its submergence plus the pressure of the atmosphere. The propeller works under a head equal to its submergence plus the same atmospheric pressure. The result is that, though a full-sized propeller may break down through cavitation, its model at corresponding speed, working under relatively a much greater head, does not break down correspondingly, and the Law of Comparison does not apply. Fortunately, we need seldom apprehend cavitation, and the fact that the Law of Comparison fails when it is present does not seriously reduce its value in enabling us to utilize in full-sized designs results of model experiments.

Accepting the proposition that the Law of the Square and Law of Comparison apply to propellers with accuracy adequate for practical purposes, we are still to consider the fact that when driving a ship the propeller is working in water disturbed by the ship, and hence under conditions not strictly comparable with the model if tested apart from the ship, in undisturbed water. This difficulty is overcome by testing the model propeller in its proper place behind the ship model, thus reducing the discrepancies of condition to minor factors, but before considering this branch of the subject let us consider facts established by model experiments for propellers working "open," i.e., apart from the ship.

A cardinal advantage of the model experiment method is that it enables us to test the effect of varying one only of the many factors affecting propeller action. When this is done on a fairly comprehensive scale we find that many past ideas as to the actual and relative importance of these factors are erroneous—some of them grotesquely erroneous.

There are still designers who attach much importance to disk area ratio and figure its effect upon efficiency regardless of other factors, usually assuming that the lower the disk area ratio the greater the efficiency.

So far as can be determined by model experiment, which is the only practicable method of investigating this factor apart from others, it is evident that such ideas are erroneous. Efficiency first goes up and then goes down as we increase disk area ratio from 0.2 or so, the best disk area ratios as regards efficiency being somewhere over 0.3, though the variation of efficiency with disk area ratio is practically negligible over a wide range on either side of that for maximum efficiency.

Perhaps the most notable fact shown by the model experiments is the great effect of blade thickness upon efficiency of model propellers—a fact practically ignored until these experiments, published in 1910.

It is almost universal practice to use blades of generally elliptical outline as developed. No merit has ever been found in freak outlines, nor do I know of any experiments or experience showing that any outline is appreciably superior to the elliptical. The question is essentially whether we should use broad or narrow tips.

We seem justified in concluding that blade outline, as long as it is smooth and fair, is a very minor factor in propeller performance, and, all things considered, the standard elliptical outline deserves to be the standard. However, for single-screw vessels where the screws must work with very high actual slip, broad tips are frequently indicated. Their larger power absorption capacity enables them to work at less slip, and the gain of efficiency associated with reduction of slip is liable to overcome the loss due to blade outline. The gain is small in any case, but worth going after when we are forced to adopt objectionably small diameters.

Efficiency is one of the two principal things we need to know about a given propeller. The second is the absorption of power.

The advantages of basing propeller design upon results of model experiment result, broadly speaking, from two sets of facts.

In the first place, by model experiment we are enabled to classify the various factors involved in propeller performance in the order of their importance, eliminate the non-essentials, subordinate those that are secondary, and determine quantitatively the influence of the only primary factors, namely, diameter and pitch. The secondary factors I would put mean width ratio, giving blade area, and blade thickness fraction, giving blade thickness. These are so secondary that by determining diameter and pitch from standard diagrams of average mean width ratio and blade thickness fraction, we obtain results that would be little changed by any likely changes in blade width and thickness.

In the second place, when we base our designs upon results of model experiments we naturally consider separately the individual factors involved, the propeller itself, the effect of the ship upon its action, and the effect of its action upon the ship. We are not yet in a position, without specific model experiment, to assess quantitatively with minute accuracy all the individual factors. But we are able to approximate to them and to consider, examine, and appraise these factors separately is essentially a sounder method than to lump them. No method of propeller design can be sound that ignores essential factors. It is obviously much more difficult to consider them lumped than separately. By model experiment only is it practicable at reasonable cost to appraise the various factors involved.

Now what of the other side? What are the objections to basing our designs upon model experiments? There is only one—the possibility that Froude's law may not apply and that the performance of full-sized propellers cannot be accurately inferred from tests of their models.

The performance of model propellers is appreciably affected by bluntness of blade edges, and there is no reason to

believe that this is not also true of full-sized propellers. If we consider it necessary for structural or other reasons to fit propeller blades with rounding edges, we should remember that this involves some reduction of efficiency and increase of diameter as compared with propellers derived from the Standard Series sharp-edged models.

There is also the question of thickness of blade sections. Rather a startling increase of efficiency is shown as blades are thinned to about one-half the customary thickness. This is a result not about to check with full-sized screws, but there happens to be one rather remarkable test that fully bears it out. I quote from my discussion in our Transactions for 1905 on Curtis and Hewins' paper.

"Some experiments made more than twenty-five years ago by Mr. Yarrow shed great light upon the effect of thickness of propeller blades. Mr. Yarrow tried twenty-five different screws upon a single-screw torpedo boat. Most of the screws tried were two-bladed and two were identical in every respect except that one was made with blades as thin as possible. The thin-bladed screw showed a very marked superiority to the thick-bladed screw.

"The maximum power which could be delivered with the latter was 350, and the corresponding speed for this boat 17.4 knots. The thin-bladed screw when absorbing 350 horse-power gave a speed of 19.15 knots, a gain of $1\frac{3}{4}$ knots, or almost 10 percent in speed, simply through a change in thickness of the two blades. The thin blade was so thin that it took a permanent set when more than 350 horsepower was put through it. * * *

To sum up and speculate to some extent, it would seem reasonably certain that if we could make propeller blades without thickness, Froude's law would apply to model and propeller virtually exactly. Taking propellers as they are, it probably applies substantially exactly to propellers with fairly broad, thin, sharp-edged blades. As we narrow blades, thicken them and make their edges blunt, we are liable to get more and more departure from Froude's law. The question, of course, arises: What difference does it make?

If we are designing propellers following closely the blade section features of the Standard Series, we can expect the full-sized propellers to follow closely Froude's law and use the diameter given by the diagrams. If our blades are thicker, narrower, and blunter than the blades to which the diagrams apply, but the tip speed low, we will discount any probable departure from Froude's law by using diameters and pitch ratios 2 percent or 3 percent greater than given by the diagrams. If, furthermore, tip speed is rather high and we are approaching, though short of, cavitating condition, we may well provide a slightly larger margin of diameter and pitch ratio—say up to 5 percent.

The above applies to the ordinary propeller of commerce with blades of ogival section. As regards freedom from cavitation and close adherence to Froude's law, this section leaves much to be desired. Unfortunately, it is not practicable with apparatus available in the ordinary model basin to test the cavitating qualities of blades of propellers of normal pitch ratios. Otherwise there is little doubt that for high-speed propellers we should long since have developed sections superior to the ogival.

DISCUSSION

CARL E. PETERSEN, naval architect, United States Lines: With reference to the matter of blade thickness, the performance of a large number of full-line cargo ships has shown marked improvement when bronze wheels are substituted for cast iron. The thickness of blades in such cases has been reduced 25 to 35 percent and it would seem that thinner blade sections are advantageous on such vessels. It would appear that more consideration should be given to the use of bronzes of 95,000 to 100,000 pounds tensile strength instead of manganese bronze having about 65,000 pounds tensile strength. Propellers of such metal are actually in service and have given excellent results.

E. A. STEVENS, JR.: I agree with what Admiral Taylor

says about blade outline, provided there is room to swing a propeller of proper diameter, but if this is not possible considerably more can be gained by broad-tipped blades than Admiral Taylor seems to think. I have had experience with ships where there was not room for a propeller of sufficient diameter and have been able to improve their performance considerably by replacing wheels having approximately elliptical blades by those with broad tips. In one case the coal consumption was reduced about 10 percent with about a knot increased in speed but all the saving cannot, however, be credited to the propeller as the engine was able to operate under better conditions with the new wheel than with the old.

While there is unquestionably a loss in efficiency from blunt blade edges, I believe the following edge has more effect than the leading one.

I do not think that blade thickness, unless it be abnormal, has as much influence upon efficiency as Admiral Taylor appears to.

W. W. SMITH: In designing a propeller it is of course desirable to use the pitch, diameter, revolutions per minute, form and area which will give the highest efficiency for the data and conditions given. In my opinion it would be most convenient to have the best or optimum value for the various numbers and forms of blades plotted on one chart. Where best values are used, such a chart would in many cases suffice for design. Where conditions make it necessary to depart from the best values R. E. Froude's chart, given in his paper before the Institution of Naval Architects in 1908, should be used. Thus, only two charts would be required for solving all problems.

REAR ADMIRAL C. W. DYSON, U. S. N.: I agree entirely with Admiral Taylor in his conclusions as to the applicability of the law of comparison to propellers within certain indefinite limits.

Admiral Taylor criticizes the lumping of the propeller-hull loss factors as being unsound. All guessing is unsound, but, where we are driven to guess, the percentage error resulting from one guess would be less than that resulting from the summation of errors in several. Where the vessel is an important one, the power high, and the hull of such form as to produce heavy losses due to obliquity of flow of the water to the propeller, the wise man will always check his estimate of the performance by trial of the self-propelled model.

Personally, I am of the opinion that there is a very close relation between the Taylor and the Dyson methods of design and that by a little investigation the two methods could be combined into one.

The Probable Effect Upon Ports of the Probable Growth of Ships

By Commander John H. Walsh (C. C.),
U. S. N. (Retired)

This paper will be published in a later issue.

DISCUSSION

JOHN H. BERNHARD: I have always felt that ports are at the mercy of the trend of the times and that ships built in accordance with these will always dictate the conditions of the port.

SAMUEL YOUNG, chief engineer of the Port of New Orleans: Commerce is growing by leaps and bounds and millions upon millions are being expended for ships and for the development of ports. It does not follow that because a certain stage of development will be demanded ten, twenty or thirty years hence, great sums should be expended for arriv-

ing at these results immediately. On the other hand, future building, both of ships and ports, should not be haphazard and without regard to ultimate limitations.

MAJOR LANSING H. BEACH, chief engineer, United States Army: I am not prepared to agree with the view expressed or implied, that in the long run ships will not be limited in growth by the accommodation in ports. Even assuming that the economics of water transportation should tend to produce an indefinite growth in the size and draft of the average cargo ship, the question of whether the ports of the world as a whole will so increase channel depths as to permit the construction and operation of such great ships is wholly a quantitative one based on relative costs and savings. Moreover there is no present indication that the ordinary cargo ships will in the near future attain dimensions at all comparable to the few very large vessels of the type illustrated in the paper. The present tendency is for the ordinary cargo ships to increase in size but by no means to approximate to the small group of exceptionally large vessels now confined principally to the liner trade between New York and certain European ports.

MAJOR JOHN W. M. BLACK, U. S. A. (Retired): I would suggest that a better title to a paper of this kind would be "The Probable Effect of Ports on the Future Growth of Ships" for really the ultimate controlling factor must be the dimensions of the channels leading to the ports and the capacity of the ports to absorb and supply cargo. The increase of the depth of ports is not impossible but the cost of such an increase is so great that in most cases the annual interest on the investment required for the work would exceed the savings to be effected by the use of the deeper and longer vessels. Port improvements are more and more becoming public works with expenditures made from public funds and it is essential that they be economically justifiable. Increase of channel dimensions and of port capacities should be made only when their cost is demonstrably less than the savings to the public which such increases would produce.

CAPTAIN F. T. CHAMBERS (C. E. C.), U. S. N.: I do not think that too much weight should be given to diagrams based upon the largest single ship of succeeding years. Of course it is a fact that smaller ships have a marked tendency to become larger ships but, with the exception of the passenger liners of the so-called Atlantic ferry, and a more limited number of oil and ore cargo ships plying between fixed ports, where special facilities have been built to accommodate them, there is almost none which exceeds in draft the limit set (32.2 feet) in the proposed resolution of the 1912 International Congress.

PROFESSOR WILLIAM HOVGAARD: The question raised is one of mutual action and reaction between ships and ports and it is difficult to say which is the stronger. In any case, it is certain that the moving force comes from the ships and this I believe is due to the fact that there is a steady growth in the world's trade and more particularly in the ocean-borne trade of the United States. Just so long and in the same measure as the expansion continues of the world's trade and therewith of its sea-borne commerce, just so long and in the same measure will merchant ships of increasing size be able to obtain full load of freight and passengers.

As regards warships, I believe that if no artificial restrictions were imposed, their displacement would still go on increasing.

CARL E. PETERSEN: Taking into account the numerous factors to be considered, there is probably a limit of size of passenger vessels which cannot be exceeded but I venture to say that in all probability the thousand-footer will be the largest vessel that port authorities will be called upon to provide facilities for, a vessel of this length becoming a reality only with economic conditions favoring it, which is not the case at present and probably will not be in the immediate future.

It was pointed out by Captain Land that the adoption of Diesel engines might have some effect on the future size of ships and by Professor Sadler that in any event economical development could not in the long run be restricted or limited by legislation.

The Economics of Transatlantic Liners of Various Lengths

By Carl E. Petersen

This paper is published on page 759 of this issue.

DISCUSSION

REAR ADMIRAL D. W. TAYLOR: Mr. Petersen, upon certain basic assumptions, has developed in a logical way the results to be expected from mixed-type vessels of various lengths and corresponding displacement. He explicitly states that his work applies to existing conditions and I want to emphasize that fact because a change in basic conditions changes entirely the conclusions. When one looks at a diagram showing the steady increase of length and displacement for transatlantic liners for seventy years past it rather compels a belief that the change of conditions in the future as in the past will favor the large vessel. It is sixty years since the *Great Eastern*, nearly 700 feet long, in the day of 300-foot liners, was a financial failure, but the 700-foot liner has now been with us and successful for some twenty years or so. For the purpose of the author he was fully justified in assuming that the passenger performance falls off with the length of vessel but is that necessarily the case? It may be for the type discussed in the paper where the 1,000-foot vessel makes less than 24 knots but, if the vessel were built to take advantage of her exceptional length by showing exceptional speed, it seems certain that her passenger performance would improve most decidedly.

I believe that if we can judge the future by the past the growing North Atlantic passenger travel will be accommodated by ships averaging longer and larger than present optimum lengths.

WILLIAM T. DONNELLY: Too little consideration has been given to the load factor; that is, a larger ship would pay, if she could be consistently and continuously loaded to capacity and it is quite apparent, as pointed out in this paper, that our ships of maximum dimensions have passed beyond this possibility.

Machinery Trials, Coast Guard Cutter Modoc

By Captain Q. B. Newman, Engineer-in-Chief,
U. S. Coast Guard

This paper will be published in a later issue.

DISCUSSION

Mr. C. P. Wetherbee, who had officially represented the Society of Naval Architects and Marine Engineers on this trial, made a report, drawing attention to the fact that he was merely an observer and, furthermore, that the trial confessed to be simply an attempt to obtain accurately essential facts and that no conclusions in regard to the particular type of machinery under test were drawn.

CAPTAIN ELLIOT SNOW, (C. C.), U. S. N.: It is not often that an official occupying the position of Captain Newman can find the time to lay out and then personally supervise trials of this character. That this was the case in the present instance lends added weight to the data recorded in the article.

I would like very much to see added to this article the combined generator and motor torque curves during reversal for which this installation was designed. These would help in arriving at an adequate explanation of the difference in performance between backing trials Nos. 1 and 2: I would like to get the views of the author, or some other propeller expert, on the following point: Will a propeller under such conditions absorb full power and correspondingly check the vessel from going ahead, or will it simply churn the water for an appreciable interval and thus nullify to a large degree the advantage of full backing power that is claimed for electric drive?

T. B. STILLMAN, Babcock and Wilcox Company: For the forced draft run No. 7 it was a relatively easy matter to obtain steady conditions in the fire room. On the contrary, during the natural draft run the course of the ship was changed several times, this affecting the available draft at the boiler uptake by nearly 100 percent on account of the variation of the direction of the ship with respect to the wind. As the amount of oil which could be burned is directly dependent on the draft available, it was necessary to vary the oil pressure from 165 pounds to 270 pounds per square inch in the effort to keep a satisfactory balance between the air being drawn through the burners and the oil being sprayed through them. This marked fluctuation in the rate of feeding the air and oil caused very natural fluctuations in the rate of flow of feed water and the pressure of steam coming from the boiler, both of these conditions being detrimental to best efficiency results.

In addition to the unsatisfactory operating conditions indicated, it should also be kept in mind that through the open fire room existing during natural draft operations there is a larger loss from the boilers due to radiation than when the fire room is closed. Thus, if the operating conditions existing during both tests are thoroughly understood, it can be appreciated how the large difference in efficiency between the two tests was secured.

Taking the trial results of the boiler as a whole, I believe we could safely say that the results are satisfactorily consistent in view of the conditions under which the tests were run as compared to those usually obtained when boiler test data are secured.

Aside from the immense value of Captain Newman's paper to the marine engineering profession in general, I feel it is of particular interest from a boiler operator's point of view, as it is very unusual to obtain as complete results from boilers operating under service conditions, as were obtained during these trials.

W. W. SMITH: Special attention is called to the rapid increase in fuel consumption below the full speed. This is due principally to insufficient blading in the turbines to absorb the energy in the steam efficiently at reduced power. It is a common fault in marine turbine installations. There are eight impulse stages in this turbine. Cross-compound turbines as used with gear drive usually have considerably more blading.

The auxiliary steam consumption, exclusive of excitors, is larger than usual on merchant vessels and seems rather excessive for an installation of this kind.

The steam consumption of the exciter unit is 14.5 percent but only about 12 percent is used for the main transmission. Due to utilizing the exhaust from the exciter unit in the lower stages of the main turbine, only about 60 percent of this loss is chargeable to the transmission gear, thus there is about 7 percent loss due to the exciter steam consumption alone which must be added to the loss in the main transmission gear. If we allow 8 percent for the latter, the total loss in transmission will be about 15 percent. This does not compare very favorably with about 3 percent loss for a double reduction gear.

Admiral Griffin, U. S. N., noted the apparent lack of

economy of auxiliaries, particularly that of the electrical units connected with the main propelling motors and stated that it would evidently be advisable to design special excitors for this class of work.

Mr. E. A. Stevens, Jr., and Mr. Maxwell Day, of the General Electric Company, also made some general remarks upon the paper and the value of the data which it contained.

The Manufacture of Heavy Steel Castings for Ships, with Special Reference to Stern Frames, Rudders, Shaft Brackets and Stems

By Hugo P. Frear

ABSTRACT

The general process of making fluid steel for castings is more or less well understood by a large percentage of the members of the Society. Great progress in the manufacture of heavy steel castings for ships in the past several decades has been made towards a reduction in the percentage of losses on account of defects or failure to meet specifications. This is due in a large measure to advancement in the art of making steel, greater attention to design and the location of sink heads, more general use of chill plates; and more careful and intelligent work in the foundry. General foundry practice and the materials used, however, have changed but little. The problem of making steel castings over the above period was well understood. Steel foundry operations of molding, core-making, pouring, etc., are very similar to those employed in the iron foundry. In the early days rolled and cast steel were equally unreliable on account of the poor quality of the product.

The difficulties in making good steel castings are and always will be greater than making iron castings. These greater difficulties are inherent for several reasons. Fluid steel is necessarily hotter, cools more rapidly, shrinks more and contains more gas than iron. On this account it is necessary to give more careful consideration to design, to the preparation of the mold, and to use a more highly refractory sand.

As already stated, the melting point of steel is higher than for cast iron and the shrinkage greater. Both the melting point and shrinkage vary more or less inversely as the carbon content. It therefore follows that the lower the carbon content the higher the melting point and the greater the shrinkage. Low silicon also increases shrinkage. As steel chills more rapidly than iron, this may also be attributed somewhat to the lower carbon content. It may be concluded, then, that a large part of the difficulties in making steel castings as compared with iron is directly due to the lower carbon content.

It is common knowledge that the shrinkage of steel is a variable quantity even in the same casting. This is more evident in long castings. There is no way to accurately estimate the shrinkage to allow at different points of the pattern. A stem casting is one of the most difficult to make so far as predicting correct shrinkage is concerned.

Shrinkage may be affected by variations in thickness and temperature of metal at different points of the mold. The temperatures are affected by thickness and by the way the metal is run in the mold. If the gates are not well distributed, the metal in some parts may be much cooler and almost ready to freeze by the time it has filled the mold. At the thicker parts of the casting the outer layer, next to the mold, chills quickly, while the inner layers are still fluid and hotter. When the second and hotter layer freezes on to the first layer, the latter is stretched, because there can be

no sliding between the two layers and then the shrinkage is less than it ought to be.

Steel is said to shrink about $\frac{1}{4}$ inch to the foot, but in practice frequently varies from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch per foot.

Many of the members of this Society can look back to the time when stern frames, rudder frames, and stems for merchant steamers were almost exclusively forged of iron. Both steamship lines and builders were slow to change from iron forgings to steel castings.

It is a mistake to believe that internal stresses or serious defects do not occur beneath the surface of heavy iron forgings, especially if made of material of doubtful quality. Broken posts or shoes have occasionally revealed these defects.

Under the great building programs of the war, iron forgings in quantity were impossible. The art of making these forgings required greater skill than could be created for emergency war work. Not only were the plants equipped to make such forgings of small capacity and few in number, but good iron was practically unobtainable. The increasing use of cast steel and scarcity of good iron scrap offered little inducement for plant extension or for younger men to take the places of those who had grown old at the forge. Even most of these older men, like Othello, lost their occupation during the war and have disappeared. Iron forging, therefore, on account of the diminishing demand before the war, followed by the almost exclusive use of cast steel, has practically become a lost art.

Before the design for a large and especially a complicated steel casting is finally approved the traffic man, patternmaker and molder should be consulted. Shipping facilities and clearances in tunnels and under bridges frequently necessitate making the casting in several parts or the elimination of foundries less fortunately located in this respect.

The designer, patternmaker and molder should have a thorough knowledge of shop conditions, shipping facilities, and the difficulties previously encountered on work similar to that in hand. The patternmaker and molder should be acquainted with the action of the fluid steel in filling the mold, and in cooling so as to anticipate and guard against eventualities which experience only can predict.

In laying out the castings, simplicity should be kept in mind. Abrupt and sudden changes in shape, sections and masses should be avoided to the greatest possible extent. Where comparatively large masses of metal cannot be avoided they should be well tapered off into the thinner sections. Large fillets should be provided at all flanges and intersections. Flanges and webs or ribs should be designed with proper draft to facilitate drawing the pattern and pulling out the drawbacks.

Experience has indicated that castings frequently come out over-weight unless steps are taken to prevent it. To offset this, castings, in which weight saving is important, have deliberately been drafted lighter than specified. In recent cases, parts have been designed from $1/16$ to $1/8$ inch under requirements, according to thickness, and on being checked found to meet specifications.

Although the designer may have consulted the patternmaker and molder before issuing the plans, it is often customary for the patternmaker and molder to consult freely during the construction of important patterns. The foundry should receive the first consideration in deciding upon the methods of molding and the best type or construction of the pattern for performing the work. It is false economy for the patternmaker to try and save a little money on the pattern at the expense of the foundry.

After the patternmaker and molder have agreed upon the type and method of making the pattern they should jointly estimate the shrinkage which may vary somewhat at different points.

If patterns are shipped any distance, they should be

properly braced and checked before shipping and again checked at the foundry.

The facing sand used in making the mold and cores must be capable of resisting the high temperatures without fusing and sticking to the casting or spalling. It must be porous to facilitate the escape of gases generated in the steel while cooling, or by contact with moist sand. Gases trapped in the metal result in blow-holes. There must be sufficient cohesion for ramming and stability for retaining form under the ferrostatic pressure of the molten metal.

An ideal sand, in order to possess the greatest possible permeability for the escape of gases, should be composed largely of grains of uniform size and of smooth, well-rounded form. It is obvious that a sand of this ideal character would not possess the necessary cohesion to retain its form without the addition of some finer material for a binder. It is also obvious that the smallest possible quantity of binding material should be used to give the greatest permeability. With the exception of a small amount of burnt sand, used only for economy, new materials should be employed.

Pure silica or crushed quartz sand (from 95 to 98 percent silica), mixed with a little burnt sand and core compound or clay, approximates these requirements. For large castings the facing sand is from 1 to 2 inches thick, according to the thickness of metal.

There are comparatively few cores used in the manufacture of the large steel castings included under the title of this paper which present as serious problems as those frequently encountered in designs requiring cores of greater area and length.

Effective venting in cores is more important even than with the mold itself. The mold surrounds the casting on the outside, and the gases have more freedom to escape outward through the sand than inward through the cores.

Flasks are boxes or containers which hold and support the sand forming any part of the mold. Cast iron, cast steel or rolled steel, on account of their durability and strength, are exclusively used in making up flasks for large steel castings. Some steel castings for ships are now so large and require such deep flasks that entirely new sections or complete special flasks have to be made.

The several types of large steel castings for ships are so different and the variety of design for each so great that a detailed description of the foundry practice for every case would be out of the question. There is a most excellent series of articles describing actual examples of molding heavy steel castings for ships in *Foundry*, Vol. 47, 1919, by Ben Shaw and James Edgar, and, for those interested, would well repay reading.

Pouring should be done as early as practicable after the mold is fitted up before it has had time to absorb moisture, and preferably while it is still warm. The getting ready of the ladles and the final adjustment of the heat should be timed for this event.

Sinkheads, risers or feeders, as they are sometimes called, may be termed a necessary evil in the production of sound steel castings. The large percentage of scrap in the sinkheads and the expense of cutting them off is one of the important items in the cost of steel castings. The main function of sinkheads is to increase the ferrostatic head in the mold and feed fluid metal into the shrinkage cavities, created during contraction.

It requires good steel and good foundry practice to produce sound castings, but these are not sufficient to guarantee uniformly good results when, on account of the design, nothing short of a miracle will do the trick.

If the design is such that the lighter sections are at the bottom and the pouring is done slowly from the top, the conditions would be ideal. The cooler metal and first chilling would be at the bottom and gradually work upward. Shrink-

age cavities or pipe during contraction formed first at the bottom would be fed from the casting and also gradually work up to the top where the final feeding would come from the sinkhead.

In the manufacture of steel castings there is unfortunately a large percentage of rejections on account of defects. It might not be an exaggeration to say that the closest scrutiny might reveal minor defects, more or less important, in almost every large steel casting. The foundryman can, however, take some consolation from the fact that many of these can be salvaged by electric welding or other means.

The various characters of defects, resulting in rejections, arranged approximately in the order of their importance, are shrinkage cracks, shrinkage cavities or pipes, blowholes, surface imperfections, warping and cold shuts. Shrinkage and gases are, therefore, the chief offenders as far as the more common defects in steel castings are concerned.

Hot metal, sudden changes in thickness, small fillets, sharp corners, quick bends, webs, flanges, internal stresses from uneven cooling, and unyielding molds and cores all contribute to the possibilities of shrinkage cracks.

These most frequently occur between heavy and light sections, in fillets, corners and at bends.

If shrinkage is estimated at $\frac{1}{4}$ inch per foot, the contraction and the necessary yielding of the mold in a length of 24 feet would amount to 6 inches. The distance between the top and bottom gudgeons on the stern frames of many merchant steamers is at least 24 feet. It is therefore apparent, if cracks are to be avoided, that the mold must yield, in this case, about 6 inches between these two points, provided the casting is not stretched in the manner above referred to.

The writer has been informed that probably in the case of 75 percent of ordinary merchant steamers, on, or after, going into commission, small cracks exist either at the top or bottom or at both top and bottom of rudder gudgeons. It is also stated that these are being continually electric welded in dry dock.

Surface defects are usually found on the upper surfaces of the castings. They are caused by loose sand floating to the top and becoming imbedded in the surface of the metal. This loose sand may have been washed off by the running metal as the result of imperfect drying, spalling off of patches, insufficient nailing of the cope and the bottom of sprues on other parts where erosion is excessive. Sand or dirt not thoroughly blown out before closing up the mold will produce the same evil effect. Sand of low refractoriness will soften and burn into the casting. The effect of this will not be limited to the upper surfaces but show over the whole casting.

Warping is generally the result of internal stresses set up by uneven cooling or from sagging on account of not being properly supported in the annealing furnace.

Cold shuts result from cold pouring. If the metal running around cores or from different gates is too cold when the streams meet, they will not make a perfect union. This fault is termed a cold shut.

Steel castings of the kind under consideration are rarely rejected now on account of shrinkage cracks or cavities and blowholes where satisfactory repairs can be made by welding. When electric arc, oxyacetylene or thermit welding were in their infancy, prejudice against them was so general that many of the castings now salvaged would have gone to the scrap pile.

The art of welding has become so well understood that it occupies a recognized place in the steel foundry and for making repairs on vessels in commission. A skilled arc or torch operator should have no difficulty in making a perfect weld. If any poor metal is run in, he knows it and should cut it out. He should not proceed to cover it up.

Large cracks or breaks should preferably be repaired by thermit welding.

Whichever process of welding is adopted, all bad material

and sufficient steel in way of cracks should be cut out so that the parts can be thoroughly preheated and space provided for running in the metal.

Welding metal is run in so hot that a hard crystalline structure extending into the casting results. It is therefore advisable to do all possible welding before annealing. Castings on which important welding has been performed after annealing, or that require machining in way of the same, should be properly annealed again after welding where possible.

The judgment and experience of the manufacturer must be relied upon in deciding the procedure to be followed in shaking out a large casting. This depends on how soon or to what extent it would be safe to subject the individual casting to air cooling and on the practice of the foundry in the construction of the mold and cores in respect to automatic yielding or collapsibility. Too early exposure to the air, in many cases, would aggravate the internal stresses with the probability that either serious cracks or innumerable infinitesimal cracks too small to be distinguishable might be developed.

Cleaning and cutting off of runners, gates, risers, fins and brackets, etc., should be completed and the casting made ready for the annealing pit or furnace as quickly as possible.

All cast steel has a coarse crystalline structure and is subject to internal stresses before annealing. The object of annealing is to improve the texture of the steel by breaking up this coarse crystalline structure, relieve the internal stresses and also soften it for machining.

No hard and fast rules can be followed in deciding when castings should be placed in the annealing furnace. If castings are cooled and thoroughly cleaned before annealing, the welding up of visible defects can be first completed.

With castings of complicated design rapid or uneven cooling might result in cracks at any stage of cooling after pouring. In such cases and where proper facilities exist it would probably be safer to get the casting into the annealing furnace as hot as it can be safely handled.

As a safeguard against sagging or warping in the furnace, the casting should be supported on blocks of small area, spaced widely to allow free heat circulation under the casting, but close enough to avoid too large spans between supports.

There are so many different designs of large steel castings for ships and warping is so erratic that each case of straightening usually presents a special problem. Sometimes the design, thickness of metal and extent of warping admit of cold straightening. In most cases this can be done better and with greater safety under an hydraulic press. In many cases local heating has been resorted to in straightening and taking out twists in castings of simpler design. The temperature of the local heating should not be greater than necessary to accomplish the purpose and should preferably be kept below the annealing point.

DISCUSSION

M. C. HUTCHINSON, of the New York Shipbuilding Corporation: The welding of defective castings will seriously delay our progress toward proper steel making besides presenting unknown dangers. The welding of new steel castings is a makeshift that records failure. Mr. Frear is right in saying that the designer should be kept in touch with the molder in making his designs but too much of the burden of responsibility should not be placed upon the designer for it should be his business to meet the demands of economy by designing castings as light as he can but strong enough and of such shape as to secure the strength with the least weight. Ship castings are frequently designed with twice the weight necessary for strength in order to get a good casting. This is not so important in castings used for buildings and bridges but is a vital matter in ships.

H. E. DILLER, metallurgical editor, *The Foundry*: In this

connection it is interesting to note that after many years of specifying definite limits for the percentages of phosphorus and sulphur allowable in steel some of the leading engineering societies of the country have a joint committee investigating the effect of these elements on different steels. This investigation is of huge magnitude but, when finished, it will be valuable to substantiate the conclusions drawn. It is only by the cooperation of the designing engineer, the pattern-maker and the foundryman that the maximum of success can be obtained.

It seems a great benefit to the industry to be able to weld castings which formerly had to be discarded but the benefit will be reduced, if the ease with which a casting can be welded reduces the interest of the foundryman in producing a perfect product. I would suggest that it would be an excellent thing that, where opportunity permits, further investigation be made in the question of the relation between porosity and the percentages of sulphur and phosphorus.

DAVID ARNOTT, American Bureau of Shipping: My own experience in the survey of ships has convinced me that large cast steel stern frames would require to give better results under the test of operating conditions before they can be considered to be in the same class with forged iron frames so far as reliability in service is concerned. The ship castings produced during the war can be grouped into three classes—good, bad and indifferent—and I am afraid that a large proportion were in the latter category. It is certainly interesting to learn that the art of welding now occupies a recognized place in the steel foundry but I rather think that the production of sound steel castings will never become an exact science, if the foundry is given blanket approval to use welding for the repair of major defects. The place for major welding operations is a drydock or repair shop—not the foundry.

H. F. NORTON, naval architect, Newport News Shipbuilding and Dry Dock Company: We have found so many large castings out of shape in a sidewise direction, where the symmetry seems to preclude the idea that shrinkage is the probable cause of the trouble, that we have come to believe that the matter of adequate support in the annealing oven is worthy of considerable further study.

Fuel Conservation and Engineering Performance Standards by Shipping Board Vessels

By Joseph E. Sheedy

This paper will be published in a later issue.

DISCUSSION

W. W. SMITH: In general the method described is thoroughly practicable and very simple. I consider it the best method I have seen for determining the general performance of a vessel. It should be of special interest and value to ship operators in checking the performance of their vessels and keeping up the efficiency of the engine room crews.

CAPTAIN ELLIOT SNOW, (C. C.), U. S. N.: The author correctly and wisely points out in the summary that the standards given are not absolutely correct. The curves are necessarily approximations and their use is of relative value only. Errors will affect all vessels alike and hence not be averse to a particular vessel of the group. It is to be hoped that the author will be able to supplement this article with curves and performance data prepared for the *Eclipse*, *Archer*, *Invincible* and other vessels of this class both before and after their conversion to electric drive.

R. W. MORRELL, marine superintendent, Tide Water Oil Company: The use of observed miles instead of engine miles as a basis for the unit of measure appears to me to introduce

unnecessary complications. While it is true that the efficiency of a vessel as a whole is the ultimate consideration, it is really the efficiency of the engineering department we are getting at and through which it is hoped to accomplish the real results. It seems to me to be preferable to segregate this engineering efficiency by confining the consideration to engine miles and thus eliminating all such uncertain variables and assumptions as are involved in the condition of the bottom, seamanship, the skill of the helmsman and the effect of currents. Suppose a ship does fall short of her theoretical miles per ton, no one can say definitely whether it was because the ship was kept bucking into a head sea instead of easing off a little and making more mileage with less labor or whether the fault lies in some adjustment of burners or links. There is some question in my mind about the basis of the correction factor applying to shaft horsepower for various depths of loading. I believe a more rational basis for applying the correction would be simply on percentage of the full load draft, leaving out the beam entirely. It is noted that the trim of the vessel has not been taken into consideration and this leads me to wonder whether certain factors are not carried to too great a refinement while ignoring others of equal importance. Improper trim is a serious handicap to any vessel, both as to propulsion and steering qualities. I am sorry Mr. Sheedy did not go further in his paper and describe the methods used in making practical applications of the data obtained, as I find this to be the most interesting part of the problem. Knowing a ship to burn too much fuel, what are we going to do about it? It is only by careful study of log abstracts and indicator cards, as well as inspection and by a process of elimination that the real trouble can be located. I must say that the work of the committee impresses me as most admirable and I would strongly urge that private shipbuilders and operators adopt similar methods.

Some Considerations on the Conversion of Steamships to Motor Ships

By Robert Haig

ABSTRACT

In considering the question, building motorships or converting steamships to Diesel motor-driven ships, American shipbuilders and shipowners have had a peculiar situation to deal with. The Shipping Board owned and held for disposal an enormous number of ships, most of which had been constructed during the war or immediately succeeding the war, and which were more or less acceptable as merchant ships in the ordinary run of business. Owing to the conditions arising in the oil industry during the latter part of 1922 and the first half year of 1923, a very firm market developed for oil tankers for a time, affording the Shipping Board an opportunity to dispose of probably 60 percent of the then existing fleet of tankers. The number of tankers sold has relieved the pressure on the market for that type of boat, and results have demonstrated the fact that, with a general increase of this business, the tanker market will shortly be found to be very bare of tonnage.

One of the first questions we had to consider on the conversion of an oil tanker to motor drive was whether the vessel should be arranged for Diesel electric-driven auxiliaries or adopt steam auxiliaries by retaining one of the main boilers and such of the present steam auxiliaries as were suitable for the new conditions. The arrangement with steam auxiliaries reduces the cost of conversion if the units already on board are in good condition and can be worked into the new scheme of things found on a Diesel motor-driven ship, but such an arrangement, while it shows very gratifying results in economy of operation and a certain

reduction in cost of conversion, can hardly be expected to give such favorable returns as we have a right to expect will be obtained in a more complete Diesel unit.

When the shipowner who handles cargo and passenger ships deals with the question of fitting Diesel motors, he is not immediately concerned with the consideration of retaining boiler power, beyond such small power as might be required for purposes of heating, which is only a minor matter.

In dealing with a general cargo boat, the same considerations have not had to be given to cargo handling as in the tanker, as we have no difficulty in obtaining electric-driven winches, windlass and steering gears of the highest type, which we have every reason to believe will be found much more economical in maintenance. With the electric auxiliaries, steam for power purposes can be entirely eliminated, and we thereby obtain the best conditions for a Diesel motor installation, as there is no question of doubt but what an all-Diesel installation is the ideal outfit.

Our experience has shown us that the ships now owned by the Shipping Board can, with very great advantage, be converted to Diesel motor-driven ships, and it will be found later that in the higher powered passenger boats the savings in fuel and space will be still more substantial. The adaptability of the general run of the Shipping Board ships to Diesel motor ships is admitted, and several shipbuilding firms are working on different types at the present time.

The Sun Shipbuilding & Dry Dock Company in the early part of the present year, in the adjustment of their business with the Shipping Board, purchased from the Shipping Board two oil tankers with Scotch boilers and geared turbines, 10,200 tons deadweight, and one general cargo boat, 11,800 tons deadweight with Scotch boilers and geared turbines, with the intention of converting these vessels from steam drive to Diesel motor drive, by removing the existing steam machinery and installing a Sun-Doxford 2-cycle opposed piston oil engine of 3,000 shaft horsepower each. The tankers have been dealt with first.

The main engines and the center and starboard main boilers of the two tankers were removed, and such steam auxiliaries as were unsuitable for the new power were also removed. The existing auxiliaries that were retained were relocated, and new foundations built and such other auxiliaries as were required were provided for, the main engine foundations were built and a new main motor of the 4-cylinder type, 3,000 shaft horsepower installed, with the new auxiliaries. The whole of the machinery was installed within the confines of the original bulkheads when the vessel was taken over. A new stern tube and shaft was fitted for the increased power put into the vessel over and above that previously developed with the turbines. The engines worked uncommonly well, without the slightest vibration. I may state that we were without data as to whether these hulls would set up vibration with this machinery being so far aft, but we were agreeably surprised to find that the working of the machinery developed a steadiness beyond that obtainable, even with our quadruple engines.

The *M. S. Bidwell* also had motors of the same size and type installed as on the *Miller County*, and after the necessary dock trials and river trial this vessel was sent on a trip to California. Neither of the motors in these two vessels had any shop trials on a test bed, yet they worked at the first trial and each succeeding trial without any failure whatever.

There is nothing mysterious in the construction of Diesel motors that need deter shipowners from adopting this type of power; the foremost marine motors on the market today are the product of good design and workmanship based on sound engineering principles. We are all familiar with the various developments from the low-pressure compound up to the present-day geared turbine, causing revolutionary changes, and at each step an improved economy was sought after; sometimes the gain was small, not exceeding 5 percent, and it

is not overstating the case when we assert that the gain from the compound engine up to the geared turbine of today has not exceeded 20 to 25 percent, taking all sizes of steam power on an average basis, yet the gain at each step was sufficiently encouraging to go forward. The shipowner was keenly alive to the value of the lowered fuel cost per horsepower and willing to invest his money in ships that would reduce his fuel bill and machinery weights.

If such economies were considered sufficiently advantageous to warrant investing in a new type of power, how very much more attractive from an earning standpoint should the Diesel motor be considered when we can offer the owner a saving in fuel alone of 55 to 65 percent. Further, when we consider the many advantages a lower fuel consumption means, it can be appreciated that it is not only lessened cost for fuel consumed that improves earnings, but less fuel consumed means less fuel accommodation in the shape of bunkers required, less fuel carried means an increased capacity for more cargo carried and a greatly increased steaming radius of the vessel.

The following known weights are set down for comparison only, but are fairly accurate:

ESTIMATED WEIGHTS OF PROPELLING MACHINERY FOR TANKERS

	Weight of Machinery, Long Tons	Fuel Oil Required for 25-Day Trip	Total
<i>S. S. Bidwell</i> , 10,200 D.W.T., 3 Scotch boilers, 2,700 S.H.P., turbines, gears and steam auxiliaries, including water in boilers	580	800 tons—boiler	1,380
Duplicate of <i>S. S. Bidwell</i> , 3 Scotch boilers, 3,000 I.H.P., triple expansion engine and steam auxiliaries, including water in boiler	670	875 tons—boiler	1,545
<i>S. S. Bidwell</i> , 1 Scotch boiler, 3,000 I.H.P., Sun-Doxford Diesel engine and steam aux., including water in boilers	758	375 tons—eng. and boiler	1,133
<i>S. S. Penna. Sun</i> , 13,000 D.W.T., 4 Scotch boilers, 4,500 I.H.P., quad. exp. and steam aux., including water in boilers	1,000	1,200 tons—boilers	2,200
Duplicate of <i>Penna. Sun</i> , 1 Scotch boiler, 4,500 I.H.P., Sun-Doxford Diesel eng. and steam aux., including water in boilers	1,007	725 tons—eng. and boiler	1,732
Duplicate of <i>Penna. Sun</i> , 1 small vertical boiler, 4,500 I.H.P., Sun-Doxford Diesel engine, Diesel and elec. aux.	980	530 tons—boiler	1,510

The weights here set down for tankers with steam auxiliaries and steam heating and cargo pumping outfit indicate the minimum of structural changes due to conversion to Diesel motor drive which are probably the least favorable conditions, yet they show remarkable savings over the steamer, but it will be noted when we consider the straight Diesel motor drive with electric auxiliaries throughout deck and engineroom that we get economies in weight and fuel required that amply repay the extra investment.

One further advantage the shipowners should bear in mind in considering the question of converting steamships to motor ships is the increased value of the shipping property, fitted with the Diesel motor. And we are forced to agree that as the number of motor vessels increase the value of the steamer will rapidly decrease.

The Sun Shipbuilding and Dry Dock Company is building the Sun-Doxford opposed piston two-cycle Diesel oil engine closely to the plans and data as furnished by Wm. Doxford and Sons, Ltd., Sunderland, England, out of their long extended experiments and research.

The motors built and installed by the Sun Shipbuilding and Dry Dock Company on the *M. S. Miller County* and *M. S. Bidwell* are the usual Sun-Doxford 2-cycle opposed piston type, 4 cylinders, 22¾-inch diameter, stroke of each piston 45½ inches, 3,060 shaft horsepower at 90 revolutions per minute. Weight of machinery, including fuel pump, flywheel, thrust shaft and Kingsbury thrust, 370 tons. The main motors for the *M. S. Challenger* are of the same size and type. This vessel, however, will be fitted with Diesel electric auxiliaries.

Economics of Transatlantic Liners of Various Lengths*

By Carl E. Petersen†

In view of the desirability of augmenting the present tonnage of the American merchant marine with vessels of the moderately large and fast passenger and cargo types, in order to make our marine a more balanced one, and because of the interest which is now manifested in these types, this paper has for its object an analysis of revenues and operating costs with a view to determining approximately how large a vessel could be built and profitably operated in the North Atlantic service under existing conditions. Needless to say, the analysis is based on observations and studies made during several years of close association with the variegated types of passenger vessels comprising the fleet of the United States Lines.

A PASSENGER or combination passenger and cargo vessel is primarily designed, constructed and placed in service for the transport of the maximum number of passengers, of the maximum amount of freight-earning cargo and mail, at a minimum expense, and hence, with maximum return to the owner on his outlay. It therefore follows that, granted proper operation, the financial success of a vessel in a particular trade involves or depends upon a predetermina-

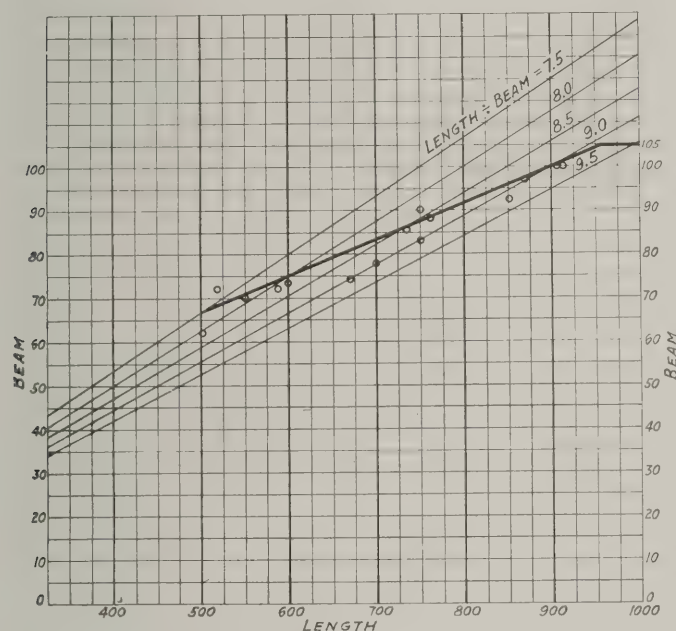


Fig. 1

tion of the needs of the trade for the average life of the vessel and the suitability of the vessel, both as regards first cost and design, for that particular trade. The predetermination of the volume, class and time of passenger travel as well as cargo and mail transport is based upon general conditions and the owner's records.

METHOD OF ANALYSIS

The method adopted in the analysis was that of taking vessels from 500 feet to 1,000 feet of various lengths, determining dimensions and particulars which could be considered comparatively proportionate, and then preparing estimates of probable revenues and expenditures, using factors based generally on the performances of similar vessels in the same trade.

Length.—The length used is the perpendicular or under-water length, but in the case of the 1,000-footer the under-

water and overall lengths are approximately the same in order that that vessel may come within the limits of the Panama Canal locks.

Breadth.—The ratio of length to breadth has been found to increase with increased length in representative North Atlantic liners, the curve, Fig. 1, illustrating this. For this reason, a ratio length to breadth of 7.5 has been taken for the 500-foot vessel, increasing proportionately up to a ratio

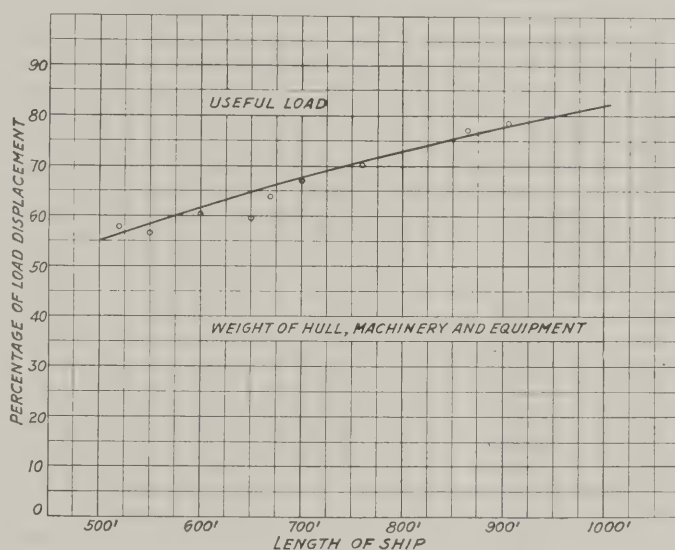


Fig. 2

of 9.0 for the 900-foot vessel. A breadth of 105 feet has been used for the 1,000-footer, this being again a Panama Canal limiting size.

Draft.—A ratio breadth to draft of 2.5 has been used for all vessels.

Block Coefficient and Speed-Length Ratio.—A block coefficient of 0.68 in conjunction with a speed-length ratio of 0.75 has been used for all vessels, this being assumed to be an appropriate coefficient for the ratio. The speeds given by the speed-length ratio adopted are sufficiently high for all practical purposes with present costs of fuel.

Horsepower.—The shaft horsepowers have been calculated on the basis of maintaining at sea in any ordinary weather the speeds given. A propulsive coefficient of 0.60 has been used and a margin of power allowed.

Deadweight.—The total deadweight has been taken as a percentage of the load displacement, the figures used in each case are those shown on curve, Fig. 2, which is based on vessels actually built.

Passenger Capacities, Rates and Performances.—The passenger capacities for each vessel are those given by the curve, Fig. 3, which is based on representative vessels. The minimum rates used are those which in all probability would be estab-

*Paper read before the Society of Naval Architects and Marine Engineers, New York, November, 1923.

†Naval architect, United States Lines, New York.

lished by the Atlantic Passenger Conference, the body controlling this feature. The average first-class summer rates have been found to exceed the minimum summer rates by 20 percent, and this figure has been used; all other passenger revenues have been based on minimum rates. The summer season for first-class rates begins eastbound with sailings April 1 to July 31 inclusive, and westbound with sailings

for each port of call. The port detention has been taken as 70 percent of time at sea. All figures are based on 334 days' service time and one month off (January) for annual overhaul.

Invested Capital.—The invested capital given in each case can only be considered as an approximate estimate of the cost to build in American shipyards and fully equip ready for sea, under present conditions, vessels suitable for the highest class and most exacting of passenger services. Curve 1, Fig. 5, illustrating invested capital plotted against length, is partly based on certain recent estimates made by representative American yards. However, the figures used may be considered sufficiently indicative of actual costs for a comparative analysis.

Freight and Mail Revenue.—Cargo revenue has been figured at a rate of \$10 per ton on the basis of 90 percent of capacity carried eastward and 40 percent westward. In the case of the 1,000-footer having a very limited cargo dead-

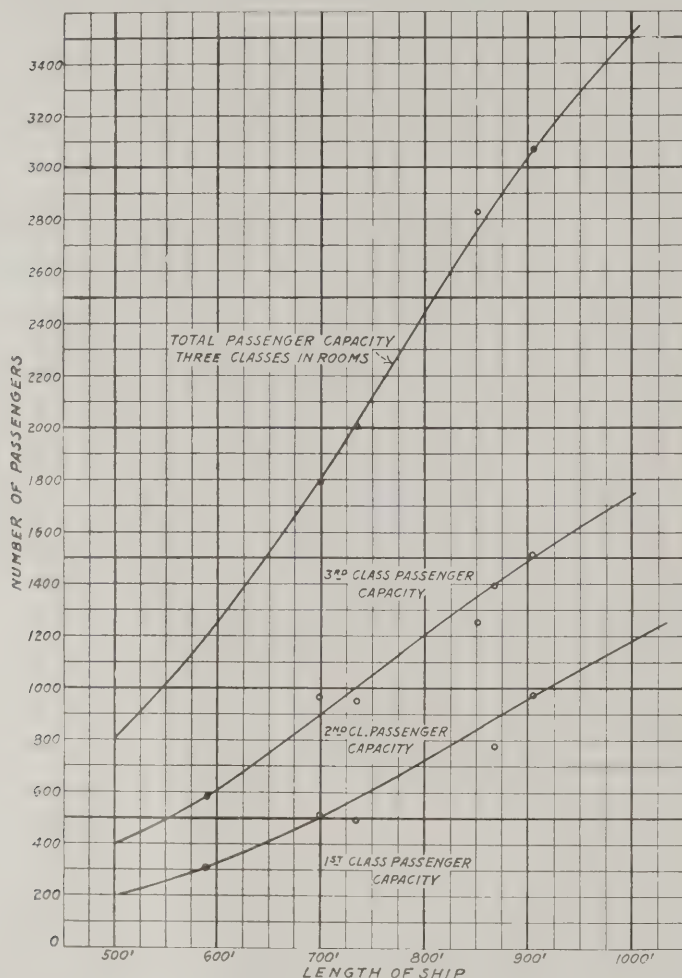


Fig. 3

July 1 to October 31 inclusive, the remainder of the year being designated winter season with reduced first-class rates.

The passenger performances expressed on the basis of percentage of capacity for each class plotted against length are illustrated in curves, Fig. 4, which have been prepared from the 1922 carrying results of a large number of representative vessels.

Crew.—Perhaps in no other phase of the operation of large liners does the personal equation play so large a factor as in the determination of what constitutes an adequate crew for a particular vessel. In this analysis the crew for each vessel has been determined separately, on a directly comparative basis by departments; the deck department complement varying with the size of the vessel, the engine department with the horsepower, and the stewards' department, cooks, etc., with the passenger capacities. The United States Shipping Board scale of wages has been used with allowances made for crew costs during the annual lay-up period.

Service and Port Detention.—For the purpose of these notes the vessels have been assumed to be on the New York, Plymouth, Cherbourg, Bremen run returning New York via Southampton and Cherbourg; in round figures a distance of 3,700 nautical miles each way. In estimating time at sea between terminals, an allowance of two hours has been made

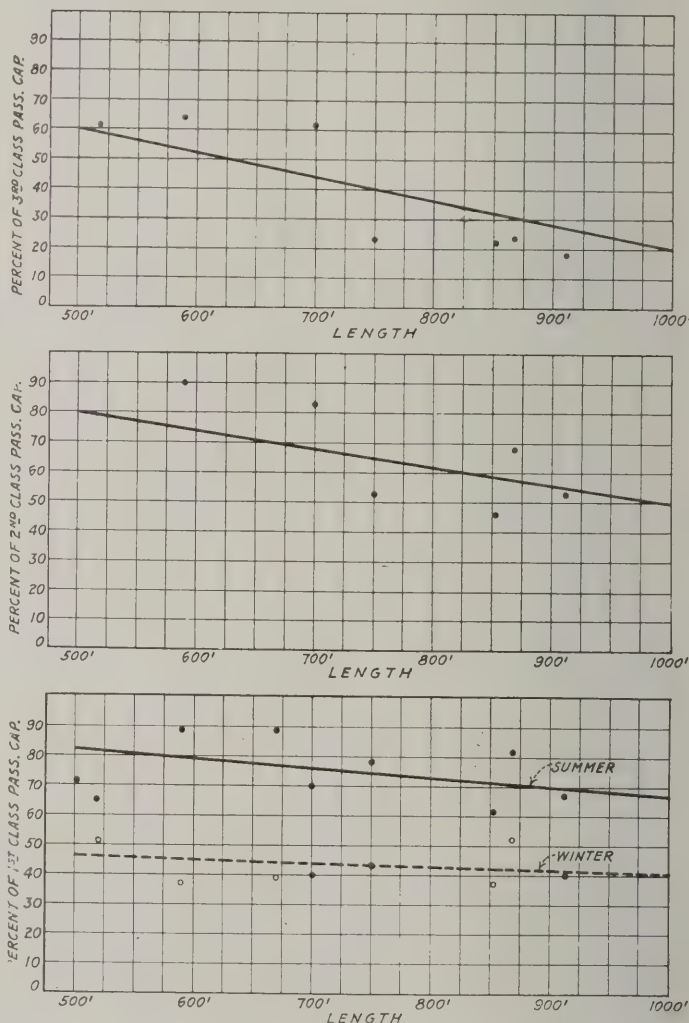
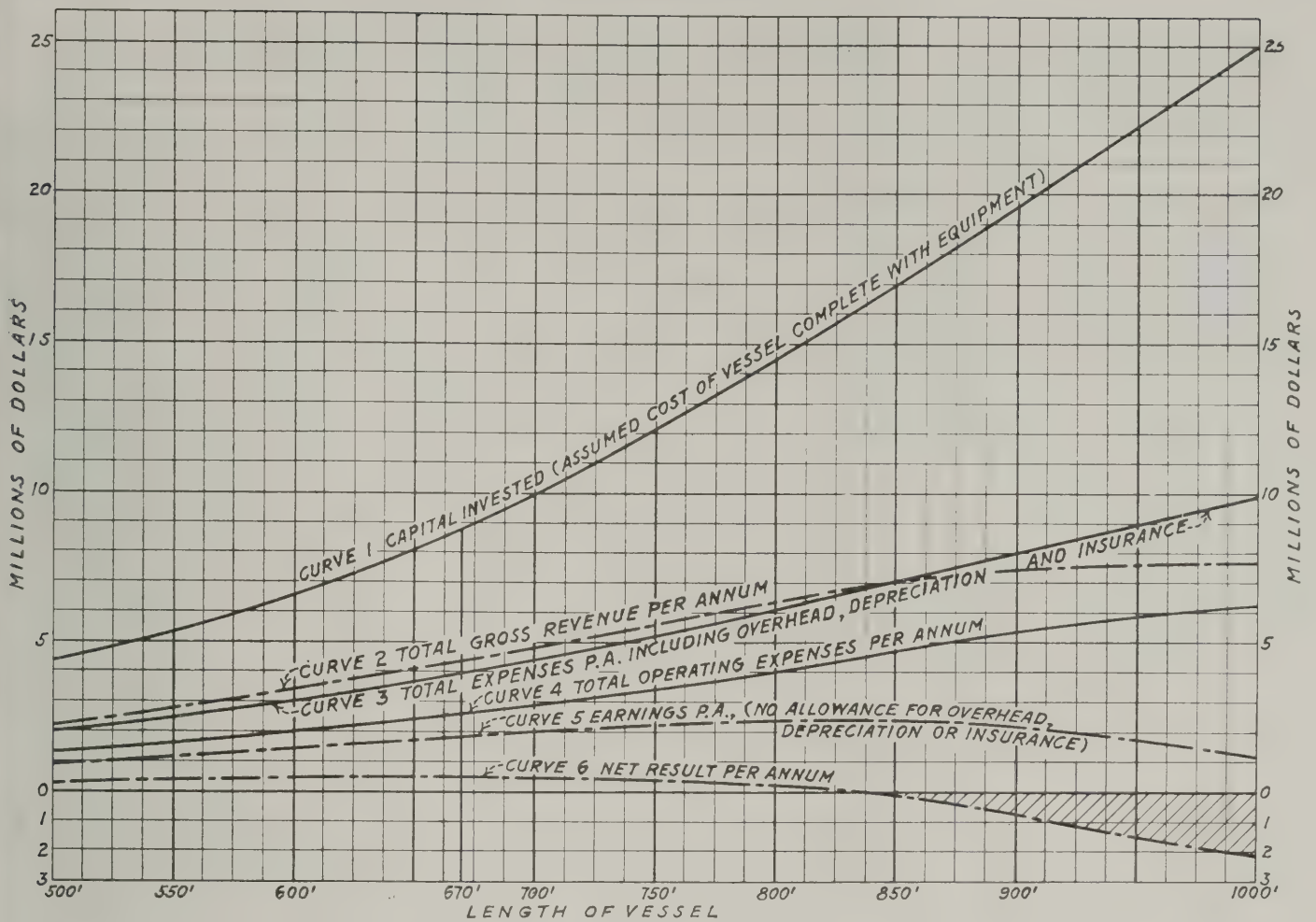


Fig. 4.—Passenger Carrying Performances

weight, the 90 percent factor of the available capacity each way has been used.

Mail revenue has been determined on the basis of 3,000 sacks eastward for the 500 and 550-footers and 6,000 sacks eastward for the remaining vessels. No mail revenue allowance has been made for the westward trips for the reason that mail in this direction is usually carried on vessels flying the flag of the country from which the mail emanates. Eastward mails carried without special contract are customarily conveyed at a rate of 80 cents a pound for letters and postcards and 8 cents a pound for other articles. It has been



found that at these rates the revenue per sack will approximate \$5, this factor being used in the analysis.

Fuel.—Oil fuel consumed has been estimated at 1.1 pounds per horsepower hour with due allowance for port consump-

tion. Cost of fuel oil delivered at New York is \$10.80 per ton, at Bremen \$14 per ton, so the average cost of \$12.40 was taken in the fuel cost calculation.

Of course, with the smaller vessels having the available

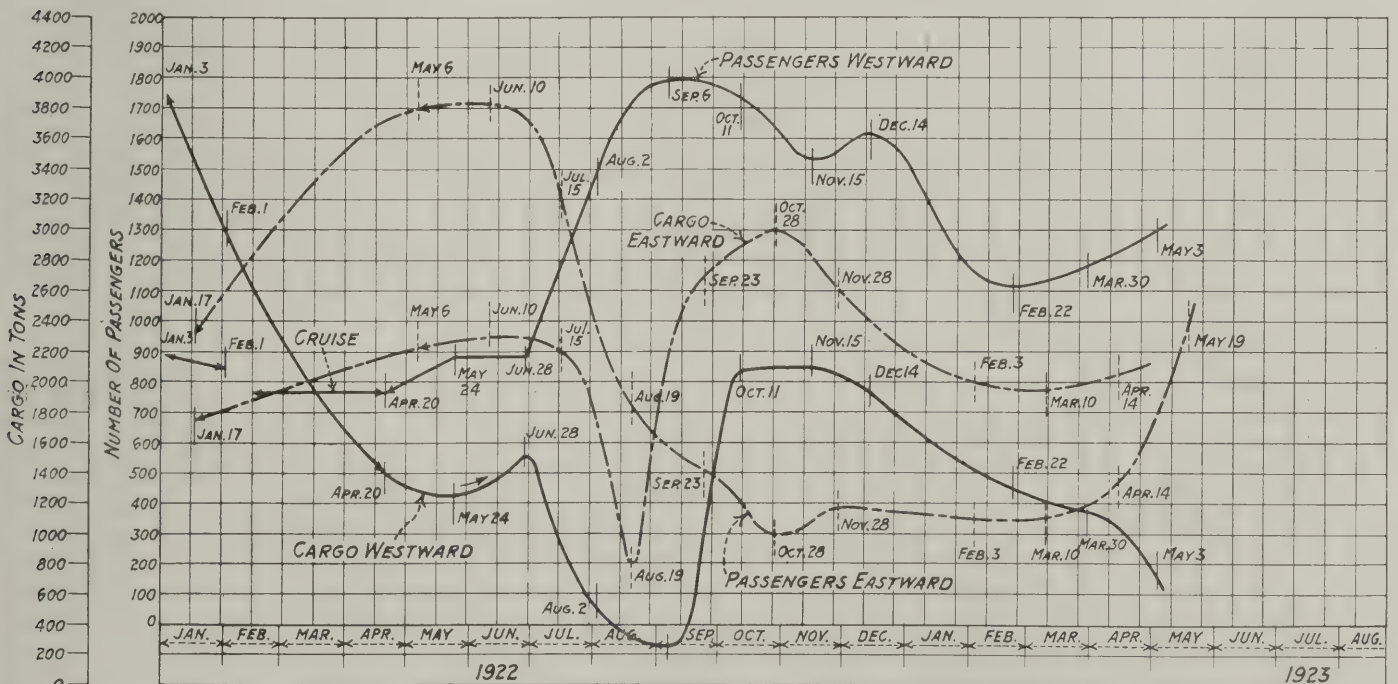


Fig. 6.—Curves of Total Passengers and Cargo Carried by North Atlantic Liner; Length Between Perpendiculars, 700 Feet; Beam, 78 Feet; Depth, 54 Feet; Draft, 33 Feet; Speed, 17 Knots

TABLE I.—PARTICULARS OF VARIOUS TRANSATLANTIC LINERS, WITH ANNUAL REVENUE, EXPENDITURES AND RESULTS

Particulars:	500'	550'	600'	670'	700'	750'	800'	850'	900'	950'	1,000'
1 Length	500'	550'	600'	670'	700'	750'	800'	850'	900'	950'	1,000'
2 Breadth	67'	71'	75'	81'	83.5'	87.5'	92'	96'	100'	105'	1,000'
3 Draft (loaded)	26.8'	28.4'	30'	32.4'	33.4'	35'	36.8'	38.4'	40'	42'	105'
4 Block coefficient	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
5 Displacement (tons)	17,443	21,546	26,228	34,163	37,528	44,623	52,621	60,878	69,942	85,680	85,680
6 Speed length ratio	16.77	17.59	18.37	19.41	19.84	20.54	21.21	21.86	22.5	23.71	23.71
7 Shaft horsepower	13,200	17,100	21,700	29,900	33,900	41,400	50,400	60,100	70,900	91,700	91,700
8 Deadweight total (tons)	8,840	12,100	16,100	21,600	24,100	28,100	33,900	40,400	48,400	57,400	57,400
9 Fuel capacity (one way + 20%), tons	7,850	10,800	14,100	18,600	21,100	25,100	30,100	35,100	41,100	48,100	48,100
10 Fresh water capacity (one way + 25%), tons	1,849	2,283	2,783	3,628	4,100	4,751	5,600	6,490	7,446	8,526	8,526
11 Passenger, crew, baggage and stores, wt. tons	1,484	1,784	2,076	2,632	2,903	3,207	3,832	4,393	5,076	5,826	5,826
12 Available cargo deadweight (tons)	277	346	421	534	612	718	836	953	1,076	1,285	1,285
13 Capacity	4,427	4,427	4,690	4,796	4,524	4,484	4,259	3,882	3,056	2,456	2,456
14 First class passenger capacity and rates	200	200	200	200	200	200	200	200	200	200	200
15 Second class passenger capacity and rates	200	200	200	200	200	200	200	200	200	200	200
16 Third class passenger capacity and rates	200	200	200	200	200	200	200	200	200	200	200
17 Crew, number	264	264	264	264	264	264	264	264	264	264	264
18 Time at sea each voyage (days)	18.70	17.84	17.12	16.20	15.32	14.44	13.62	12.86	12.14	11.46	10.82
19 Time in port each voyage (days)	10.51	11.01	11.47	12.12	12.82	13.54	14.30	15.08	15.88	16.70	17.54
20 Number of trips per year (of 334 days)	10.51	11.01	11.47	12.12	12.82	13.54	14.30	15.08	15.88	16.70	17.54
21 Invested capital	\$4,400,000	\$5,400,000	\$6,600,000	\$8,800,000	\$10,000,000	\$12,100,000	\$14,400,000	\$16,900,000	\$19,600,000	\$25,000,000	\$25,000,000
Revenue:											
22 Passenger, first class	\$556,639	\$775,132	\$1,012,394	\$1,534,589	\$1,770,337	\$2,296,381	\$2,889,630	\$3,488,688	\$4,076,032	\$5,010,044	\$5,010,044
23 Passenger, second class	470,400	497,668	595,843	831,856	855,233	1,012,459	1,053,860	1,125,012	1,165,118	1,156,400	1,156,400
24 Passenger, third class	519,614	673,771	810,919	953,247	992,779	1,130,313	1,217,529	1,274,919	1,254,470	1,081,706	1,081,706
25 Freight	589,690	634,640	711,750	758,520	719,580	758,160	788,160	694,720	557,280	85,270	85,270
26 Mail	165,000	165,000	360,000	367,200	370,200	350,000	404,400	420,000	421,200	450,000	450,000
27 Total revenue	\$2,251,343	\$2,746,811	\$3,490,906	\$4,445,412	\$4,708,179	\$5,580,383	\$6,313,579	\$7,003,339	\$7,434,104	\$7,783,440	\$7,783,440
Expenses:											
28 Fuel	\$406,732	\$526,182	\$668,137	\$920,278	\$1,043,882	\$1,274,621	\$1,551,624	\$1,850,328	\$2,184,706	\$2,824,484	\$2,824,484
29 Wages and salaries of crew	227,700	280,294	357,742	477,848	529,656	633,880	746,132	861,902	981,235	1,206,235	1,206,235
30 Subsistence, passengers and crew	207,115	252,865	298,421	381,008	414,217	469,637	530,302	626,457	729,208	869,981	869,981
31 Repairs and ship and engine supplies	220,000	270,000	330,000	440,000	500,000	605,000	720,000	845,000	980,000	1,250,000	1,250,000
32 Towage, pilotage, wharfage, dockage, port dues	45,088	50,713	70,645	94,094	103,933	127,050	152,814	180,159	210,673	269,603	269,603
33 Laundry	13,270	18,988	18,506	22,675	24,155	26,651	28,993	32,424	31,436	31,161	31,161
34 Freight handling, mail and baggage expense	202,615	238,396	252,369	269,819	257,879	270,486	268,101	255,567	211,761	60,143	60,143
35 Total operating expense	\$1,322,520	\$1,620,438	\$1,995,820	\$2,605,722	\$2,873,732	\$3,407,325	\$3,997,966	\$4,602,288	\$5,223,396	\$6,332,607	\$6,332,607
36 Overhead—administrative, advertising, etc.	330,630	405,110	498,955	651,430	718,430	851,831	999,491	1,150,647	1,305,849	1,583,152	1,583,152
37 Depreciation and insurance	352,000	432,000	528,000	704,000	800,000	968,000	1,152,000	1,352,000	1,568,000	2,000,000	2,000,000
38 Grand Total expenses	\$2,005,150	\$2,457,548	\$3,022,775	\$3,961,152	\$4,392,152	\$5,227,156	\$6,149,457	\$7,105,235	\$8,097,245	\$9,915,759	\$9,915,759
Results:											
39 Net result per annum	\$246,193	\$289,263	\$468,131	\$484,260	\$316,027	\$353,227	\$164,122	Loss \$663,141	Loss \$2,132,319	Loss \$2,132,319	Loss \$2,132,319
40 Cost of operations P.A./\$1,000,000 invested	300.573	300.081	302.406	296.105	287.372	281.597	277,636	256,499	233,304	253,304	253,304
42 Result per annum per \$1,000,000 invested	55.953	53.567	70.929	55.029	31.603	29.192	11.397	Loss 6,029	Loss 85,292	Loss 85,292	Loss 85,292

deadweight, in view of the high cost of fuel relative to freight rates, it may be an advantage to carry round-trip fuel. In this comparison, however, all vessels are dealt with similarly carrying but one-way fuel plus an adequate reserve.

Subsistence.—Subsistence costs have been figured at the standard Shipping Board allowance of \$0.65 per man in crew per day and separate rates per passenger per day for each of the first, second and third classes.

Repairs and Supplies.—These have been taken at 5 percent per annum of the invested capital.

Towage, Pilotage, Wharfage, Dockage, and Port Dues.—Wharfage and dockage have been calculated for each vessel for the time in port. A cost factor, towage, pilotage and port dues expressed on a displacement tonnage basis was obtained from these costs of similar vessels in the same service and used.

Freight Handling and Mail and Baggage Expense.—This expense is, of course, proportionate to the quantity handled, factors from actual costs having been used.

Overhead.—Overhead—administrative, advertising, etc.—has been taken at 25 percent per annum of total operating costs.

Depreciation and Insurance.—Depreciation has been charged and insurance costs taken at 8 percent per annum of the capital invested.

Results.—Particulars of vessels, revenues, expenditures and results are given in Table I.

As a matter of interest in order that those unacquainted with the North Atlantic Service may realize the large variations, due in part to the season, in cargo and especially the passenger trades, there is given in Fig. 6, curves of total passengers and cargo performances both eastward and westward for a well-known vessel from January, 1922, until May, 1923.

CONCLUSION

For the greatest return on investment today, the 600-footer is the logical choice, a vessel of this length giving about 7 percent per annum return on investment. In this connection, it is interesting to recall and comment upon the wisdom of the Cunard Line in adopting this length for the majority of their post-war-built fleet of vessels.

If a return on investment of about 3 percent per annum would be considered sufficient, an owner would be justified in designing, building and operating a vessel of

750 feet in length; the construction and operation of any vessel having a length exceeding this cannot be justified from an American private owner's point of view under existing conditions. A European owner, however, with lower construction, equipment and operation costs, but with the same gross revenue, having in mind only a 3 percent return, could, of course, somewhat exceed this length; but for maximum return on investment the results would be analogous to the American comparison.

There are very few trips a year when the 900- or 1,000-footers will approach capacity in passenger-carrying performances, and during the remainder of the year these vessels will not carry any more passengers than, say, the 600- or 700-footers, the passenger traffic being so seasonal and the capital invested in lengthier vessels so increasingly large that these factors in themselves should indicate the economics of the very large vessels in comparison with more moderately sized ones. It may, therefore, be said that world conditions will have to very materially improve before the 1,000-footer is an economic probability for either a European or American company, although less so for the European.

Fig. 5, in addition to indicating the assumed invested capital, shows the results in Table I in graphical form. It is interesting to note that the items which render the very large vessel financially inefficient are insurance and depreciation, or those items dependent upon the capital invested, as well as the fact that the proportion of actual traffic to capacity is less in the larger vessel than in the vessel of more moderate dimensions. The present exceptionally high first costs are in part the deterrent to the building of large vessels.

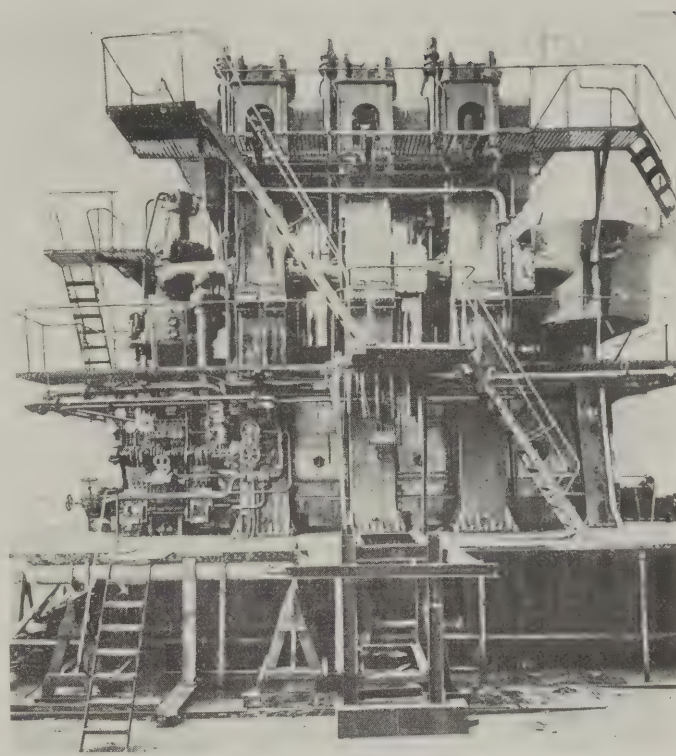
North British 2,000 Horsepower Double-Acting Diesel Engine

By Our Special London Correspondent

A CERTAIN amount of preliminary information has already been published concerning the new type of double-acting two-cycle engine which the North British Diesel Engine Works has developed. The 2,000 brake horsepower two-cycle set which this firm is constructing for installation in a 5,000-ton cargo ship is now completed, and some details of the results achieved are of special importance in view of the fact that a great saving in weight and space has been effected by the adoption of this principle of operation.

As will be seen from the illustration, the engine has three cylinders, the dimensions being $24\frac{1}{2}$ inches bore and 44 inches stroke; the rated power given above is developed at 100 revolutions per minute. The length of this engine overall is only 30 feet, including the crankshaft driven scavenging pump and the air compressor. The height is approximately the same and the width over the bedplate is scarcely more than 10 feet. Perhaps the most important fact of all, however, is that the weight is only about 200 tons, whereas it is considered that an average four-cycle single-acting engine would weigh about 360 tons to develop equal power at the same speed.

On the left can be seen the control gear which is all hand-operated, the fuel pumps being driven by a mechanism on the sliding cylinder itself. The camshaft is thus eliminated with the idea of simplifying the design. Exactly the same principle of operation has been employed as in the experimental engine which was built before constructing this large set. The cylinder has a sliding motion and, in its movement in relation to the piston, uncovers the exhaust and scavenging ports at the correct times. The cylinder slides over the top and bottom covers, a distance of some 12 or 15 inches, and the gudgeon pin is brought out through slots in the cylinder, allowing the drive to be taken on to the crank-



New 2,000 Brake Horsepower, Double Acting, Two Cycle North British Diesel Engine

shaft through a forked connecting rod. The cylinders themselves are driven from the main crosshead pins and although the employment of sliding cylinders may seem to be somewhat surprising, it is claimed that no difficulties are likely to be encountered from this construction.

It is not to be expected that the fuel consumption of an engine of this class will be equal to that of a four-cycle single-acting motor. It was found on the preliminary trials that the figure attained was about 0.45 pound per brake horsepower hour, this being some 12 or 13 percent higher than with the modern Burmeister & Wain four-cycle single-acting type. It is possible, however, that improved results will be achieved with further experiments, and in any case the saving in weight and space—and presumably cost—is so important as to give the engine a wide field of application, should it prove thoroughly reliable in service.

Army Launches First All-Electric Dredges

TWO all-electric dredges, the *A. Mackenzie* and the *W. L. Marshall*, were launched on November 20 at the yards of the Sun Shipbuilding and Dry Dock Company, Chester, Pa. These dredges, which were built for harbor service by the Engineer Corps of the United States Army and equipped electrically by the Westinghouse Company, are the first all-electric vessels of this type ever built.

Two more dredges of the same type, the *Dan C. Kingman* and *Wm. T. Rossell*, will be launched at the Sun yards in the near future. On completion the *A. Mackenzie* will be assigned to Mobile Bay, the *W. L. Marshall* to the north Atlantic Coast, the *Dan C. Kingman* to the south Atlantic Coast, and the *Wm. T. Rossell* to Coos Bay.

Every detail of these dredges has been designed by the Engineer Corps. Electricity is used for every possible purpose, including propulsion, the operation of all auxiliary machinery, cooking, heating and lighting. Oil engines generate the necessary power; and the movements of the ships are controlled directly from the pilot house.

Factors Affecting the Economy of Lake Freighters*

Trade Conditions on the Great Lakes—Size and Speed of Vessels—Detention in Port—Influence of Nature of Cargo on Earnings—Operating Expenses.

By Professor Anders F. Lindblad†.

IT is well known that the transportation and handling of cargo in bulk is done on the Great Lakes at a very cheap rate. In fact, it is probably done more economically in this district than anywhere else in the world.

During the last few years there have not been any fundamental changes in the construction of the lake freighters. The vessels do not carry any machinery for handling of the cargo. The necessity for a quick dispatch has led to the installation on the docks of both loading and unloading machinery, which in turn is specially designed to suit each kind of cargo. It is largely due to the remarkable efficiency

the displacement has been possible only by increasing the length and by adopting a very full block coefficient; as a rule the block coefficient is 0.87 to 0.88. The depth of the vessels has been governed mainly by the height of the ore docks. In order to get sufficient slope on the ore spouts the vessel must not, when light, be too high out of the water. A molded depth of 32 feet to 33 feet has been adopted on the largest of the freighters.

GENERAL CONDITIONS OF THE LAKE TRADE

Bulk cargoes of iron ore, coal and grain form the main part of the trade on the Great Lakes. A large amount of stone, lumber, and general cargo is also carried, but such cargoes are usually transported by vessels of other types than the typical bulk freighters.

Nearly all the iron ore and the grain are shipped eastward from the ports on Lake Superior to the lower lakes, most of it to the Lake Erie ports. The movement of coal is in the opposite direction from the ports on Lake Erie to the head of the lakes.

Fig. 1 gives a summary of the trade from 1900 on. It shows that the amount of iron ore and grain transported is, in general, two to three times as much as that of the coal. This, obviously, means that the vessels on the westward journeys can secure cargoes for only about one-half to one-third of the number of trips. The remainder of these westward trips therefore have to be made without any cargo in the light or ballasted condition. Every shipowner, of course, wishes to get as many as possible of the available coal cargoes for his ships so as to avoid running them up the lakes without any paying cargo. There is therefore always a very keen competition in getting the contracts for moving the coal, which

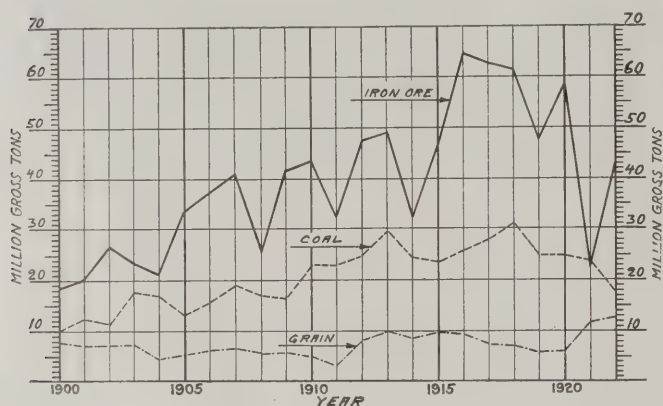


Fig. 1.—Bulk Freight Movement on the Great Lakes

of this machinery that the bulk cargoes on the Great Lakes are handled with such an unusual speed and at such a low cost. The nature of this machinery has had such a great influence on the structural details of the ships that we may say that the design has been worked out mainly to suit the loading and unloading machinery.

The increase in size of the vessels has been most remarkable. In 1886 the largest ship was 303 feet long; in 1898 two vessels were built which were 455 feet long with 50 feet beam and a depth of 29 feet. The largest ships now on the lakes are *W. Grant Morden*, 625 feet overall length, 59 feet beam and 33 feet depth with a deadweight capacity of 14,200 gross tons; and the steamers *Col. J. M. Schoonmaker* and *Wm. P. Schneider, Jr.*, 617 feet overall, 64 feet beam and 33 feet depth, deadweight capacity 14,000. The majority of the newer ships have the following dimensions: Length on keel, 580 feet; breadth molded 60 feet, and 32 feet depth; deadweight capacity about 12,100 gross tons at draft of 20 feet.

While the length of the vessels has been gradually increased, the beam and the molded depth have not been increased in the same proportions. The beam has, to a certain extent, been limited by considerations of locks, narrow channels, etc., and by the reach of the unloading machinery. The draft is limited by the depth of water at the locks at Sault Sainte Marie and in the channels connecting the lakes. The available draft is at present about 20 feet. An increase in

*Paper read before the Society of Naval Architects and Marine Engineers, New York, November, 1923. The investigations in this paper were started in the summer of 1922, and the costs of the vessels are estimated as of that date. Since then there has been an increase of from 20 percent to 30 percent. This, however, does not have any material effect on the comparative results.

†Assistant professor of naval architecture, University of Michigan, Ann Arbor, Mich.

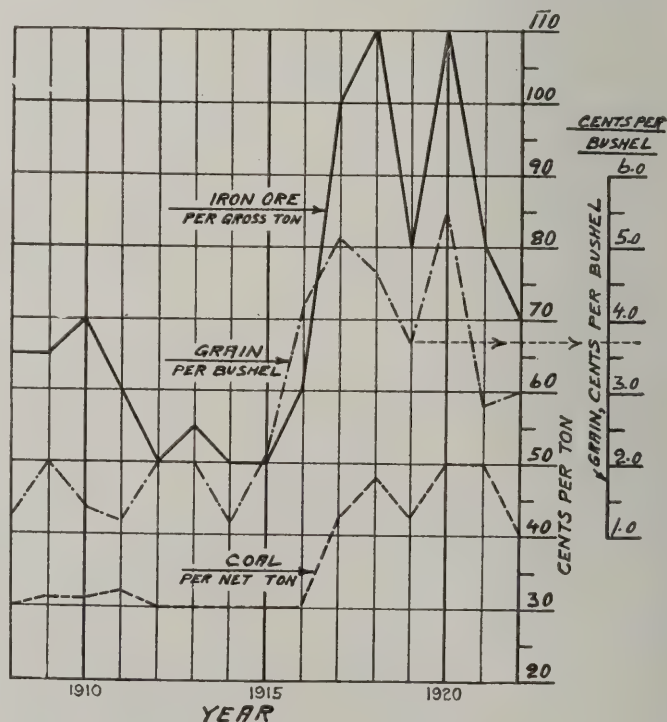


Fig. 2.—Freight Rates

naturally tends to lower the rate on this commodity. Owing to this condition the coal is generally transported at a rate of not more than about a half of the rate for iron ore.

The shipment of grain on the Great Lakes during the last few years has increased enormously, and is a very important factor in the operation of the lake freighters. Most of the grain is moved either late in the season, after the harvest, or otherwise early in the spring. While the rate on iron ore

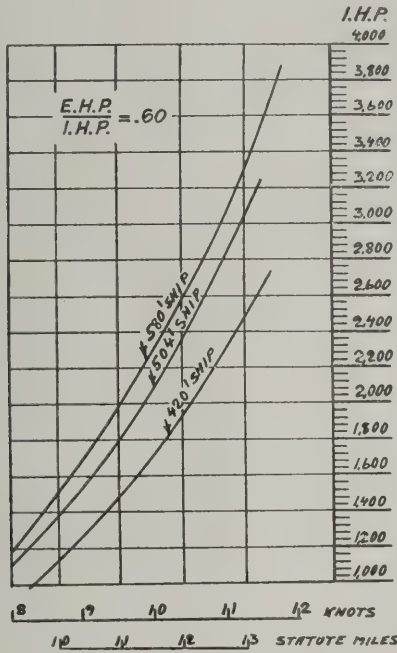


Fig. 3.—Horsepower Curves

Length	Beam	Draft	Displacement Tons at 2,240 lbs.	Block-Coefficient
580'-0"	60'-0"	20'-0"	16,950	.8768
504'-0"	56'-0"	20'-0"	13,717	.8747
420'-0"	52'-0"	20'-0"	10,192	.840

and coal practically does not change during a sailing season, the grain rate fluctuates surprisingly from day to day. It is not uncommon that the amount of profit for the whole season largely depends on the rates which have been obtained for the last few trips with grain toward the closing of the navigation. There is always an uncertainty concerning the length of the sailing season, which is mainly governed by the weather conditions. The formation of ice, for example, may cause an early closing of navigation. This also has a great influence in making the grain rate changeable and subject to speculation.

Fig. 2 gives the rates obtained for the different kinds of cargoes. If we neglect the peak during the war years, it appears that the freight rates are slowly increasing.

As iron ore, coal and grain are some of the most important commodities of the American nation, it is to be expected that the rates for transporting them on the Great Lakes would, as a rule, follow the upward or downward trend, as the case may be, of the general economic conditions of the country. Lake transportation is so closely connected with the iron and steel industry that the condition of this industry is really the determining factor in the fixing of the freight rate on iron ore. It is also well known that the United States Steel Corporation, for example, through its control of the largest fleet of lake freighters, Pittsburgh Steamship Company, has a very decided influence in this respect.

ASSUMPTIONS

In order to make a systematic analysis of the various factors affecting the economy of the lake freighters it has been necessary to make a considerable number of assumptions, and these will be discussed in the following paragraphs.

To some extent I have followed the method used by Mr. Alfred J. C. Robertson in his interesting paper "Economical Cargo Ships."*

DIMENSIONS

For calculations three typical vessels were chosen with the following particulars:

Length	Beam	Depth	Displacement at 20' draft	Block coefficient
580'	60'	32'	16,950 long tons	0.876
504'	56'	30'	13,717 long tons	0.874
420'	52'	28'	10,192 long tons	0.840

The load draft was in all cases taken as 20 feet, which at present seems to be a fair average; although frequently some trips may be run at a deeper draft, when the water levels on the lakes so permit.

WEIGHTS

From a comparison of several of the present lake freighters the following hull weights (steel, wood and outfit) were obtained:

580 foot vessel,	4,287 long tons
504 foot vessel,	3,300 long tons
420 foot vessel,	2,426 long tons

The weight of the machinery was assumed to vary directly with the horsepower, and the weight in tons was taken as I. H. P.

4.7

SPEED AND POWER

Calculations were made for speeds of 10, 11, 12 and 13 statute miles per hour. The horsepower needed at the different speeds was estimated from some curves of results obtained from models of similar vessels, which have been tested in the University of Michigan tank. Fig. 3 shows the horsepower curves, and Table I gives the indicated horsepower as scaled off at the different speeds.

A propulsive coefficient of 0.60 was assumed, a value which experience seems to indicate is easily reached on these very full vessels. In fact, some of the published results do not agree with the tank results unless a higher propulsive coefficient is assumed.† The naval architects on the Great Lakes often figure with a propulsive coefficient of 0.65.

COST OF VESSELS

Table I gives the cost of the vessels as used in my calculations. The costs of the hulls, steel, wood and outfit were

TABLE I—COST OF VESSELS

Vessel 580' × 60' × 32'				
Speed in miles.....	10	11	12	13
I. H. P.....	1,500	1,970	2,580	3,300
Cost of machinery.....	\$73,750	\$95,315	\$122,205	\$152,350
Cost of hull.....	\$677,795	\$677,795	\$677,795	\$677,795
Total cost of ship.....	\$751,545	\$773,110	\$800,000	\$830,145
Vessel 504' × 56' × 30'				
Speed in miles.....	10	11	12	13
I. H. P.....	1,380	1,800	2,340	3,045
Cost of machinery.....	\$68,125	\$87,600	\$117,776	\$141,855
Cost of hull.....	\$521,730	\$521,730	\$521,730	\$521,730
Total cost of ship.....	\$589,855	\$609,330	\$633,506	\$663,585
Vessel 420' × 52' × 28'				
Speed in miles.....	10	11	12	13
I. H. P.....	1,130	1,490	1,940	2,445
Cost of machinery.....	\$56,255	\$73,285	\$93,960	\$116,360
Cost of hull.....	\$383,550	\$383,550	\$383,550	\$383,550
Total cost of ship.....	\$439,805	\$456,835	\$477,510	\$499,910

Costs of vessels are estimated as of 1922. Since then they have increased from 20 to 30 percent.

taken to vary directly with the weights. The cost of machinery was estimated on the assumption that for a larger horsepower the cost would be smaller per indicated horse-

*See Transactions S. N. A. & M. E., 1919.
†Compare Professor Sadler's discussion of Admiral Taylor's paper, "Some Experiments on Propeller Position and Propulsive Efficiency," Transactions Society Naval Architects and Marine Engineers, 1922.

TABLE II.—AVERAGE STAY IN PORT (FOR VESSELS BELONGING TO THE PITTSBURGH STEAMSHIP COMPANY)

	1912		1913		1914		1915		1916		1917		1918		1919		1920		1921		1922	
	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.	Hrs.	Min.
Average stay in lower lake ports.....	20	9	21	9	17	18	17	41	20	30	25	28	22	18	22	55	34	33	20	54	23	32
Average stay in upper lake ports.....	11	51	13	52	9	12	7	46	9	42	8	42	9	8	12	17	9	30	7	31	6	19
Average time spent in port receiving and discharging cargoes..	32	..	35	1	26	30	25	27	30	12	34	10	31	26	35	12	44	3	28	25	29	51
GROSS TONS																						
Average cargo carried.....	6,796		7,283		7,572		7,534		7,989		8,360		8,498		8,695		8,475		10,147		8,402	
Largest cargo carried.....	13,067		12,373		12,222		12,087		13,521		13,732		13,505		13,612		13,912		12,796		12,370	
Cargo in tons (Iron ore.....	2,240		10,325		5,897		10,613		8,179		11,379		12,032		12,655		8,529		12,237		12,382	
Fastest loading record.....	27,300		26,964		26,550		26,080		22,320		22,040		21,675		21,210		16,560		16,320		15,885	
In hours and minutes.....	2:35		1:15		1:30		1:00		2:15		2:05		1:50		0:40		1:35		0:16½		1:35	
Rate of fastest loading record per hour.....	4,136		4,718		7,075		8,179		5,057		5,775		6,903		12,800		7,730		45,024		6,977	

*From "Annual Report Lake Carriers' Association," 1922.

TABLE III.—CALCULATIONS FOR CURVES IN FIG. 9

	580' Vessel				504' Vessel				420' Vessel			
	10	11	12	13	10	11	12	13	10	11	12	13
Speed in miles.....	10	11	12	13	10	11	12	13	10	11	12	13
Total number of trips.....	16	18	20	22	16	18	20	22	16	18	20	22
Cargo in tons (Iron ore.....	12,270	12,154	11,906	11,831	10,054	9,931	9,820	9,668	7,469	7,381	7,271	7,151
(2,240 lbs.) } Coal.....	12,135	11,983	11,801	11,591	9,922	9,796	9,635	9,428	7,360	7,251	7,117	6,972
Income												
14, 16, 18, 20 trips with ore at 80 cents per ton.....	137,424	155,564	171,450	189,300	112,602	127,120	141,388	154,680	83,650	94,480	104,706	114,420
Two trips with grain at 3 cents per bushel.....	27,480	27,224	26,688	26,500	22,520	22,244	21,996	21,656	16,730	16,553	16,286	16,018
Five trips with coal at 45 cents per ton.....	27,300	26,964	26,550	26,080	22,320	22,040	21,675	21,210	16,560	16,320	15,885	15,685
Total income.....	192,204	209,752	224,668	241,880	157,442	171,404	185,059	197,546	116,940	127,353	136,877	146,123
Outgo												
Depreciation, Upkeep and repairs.....	90,185	92,773	96,000	99,617	70,783	73,120	76,021	79,630	52,777	54,820	57,301	59,989
Insurance.....												
Wages.....	31,737	33,875	33,875	33,875	30,112	30,112	32,250	32,250	30,112	30,112	32,250	32,250
Coal at \$6.00 per ton.....	19,776	26,201	34,560	45,010	17,913	23,654	31,078	40,682	14,722	19,590	25,776	32,736
Stores (deck and engine).....	6,000	6,000	6,000	6,000	5,000	5,000	5,000	5,000	4,000	4,000	4,000	4,000
Meals.....	6,277	6,885	6,885	6,885	5,872	5,872	6,480	6,480	5,872	5,872	6,480	6,480
Management.....	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Total cost of operation.....	158,975	170,734	182,320	196,387	134,680	142,758	155,829	169,042	112,483	119,394	130,807	140,455
Total income.....	192,204	209,752	224,668	241,880	157,442	171,404	185,059	197,546	116,940	127,353	136,877	146,123
Total outgo.....	158,975	170,734	182,320	196,387	134,680	142,758	155,829	169,042	112,483	119,394	130,807	140,455
Profit in dollars.....	33,229	39,018	42,348	45,493	22,762	28,646	29,230	28,504	4,457	7,959	6,070	5,668
Profit in percent on the investment.....	4.42	5.05	5.29	5.48	3.86	4.70	4.62	4.30	1.01	1.74	1.27	1.13

power than for an engine of lower power. The price was taken to vary in direct proportion to the power from \$45.00 per indicated horsepower for machinery of 4,000 indicated horsepower to \$50.00 per indicated horsepower for machinery of 1,000 indicated horsepower.

The cost of hull and machinery was so chosen that with machinery for 12 miles speed the 580-foot would cost \$800,000.

TIME IN PORT AND NUMBER OF TRIPS

The actual time required for loading and unloading is very short, and some remarkable records have been made, as shown in Table II. It is not uncommon that even a cargo of 10,000 to 12,000 tons of iron ore is loaded into a vessel in about three to four hours. Often, however, there are delays due to congestion at the docks, when several vessels are waiting for their turn. But such delays are, in general, not very long in the coal and ore traffic. When the vessels carry grain there is quite often a more serious loss of time, particularly in the discharging end at the Lake Erie ports, where the grain elevators in the last few years have been unable to handle the increasing traffic in a satisfactory way. Delays of several days and even weeks have been rather common at the closing days of the season.

Table II shows that for vessels which carry only coal and ore the average stay in port is about thirty hours per round trip. Shorter delays, such as waiting for their turn to be taken through the locks at Sault Sainte Marie and encountering fogs and storms, will also cut down to some extent the time the vessels are under way. There is not much difference between the time a larger vessel has to spend in port and that of a smaller. For my calculations I have assumed that a speed-difference of one mile per hour will make a difference of two round trips during the entire season. Fig. 4 shows that this is approximately correct.

FUEL CONSUMPTION

The coal consumed was computed at 1.7 pounds per indicated horsepower per hour. It was assumed that the coal

consumption in port for every trip would be 16 tons for the 580-foot vessel, 12 tons for the 504-foot vessel, and 10 tons for the 420-foot vessel. Calculations were made for different prices of coal from \$4 to \$8 per ton.

OPERATING EXPENSES

All the operating expenses were figured on the basis of a season of 225 days. The wages for the crew were calculated from the wage scale of the Lake Carriers' Association, which was in effect during the season of 1922. The cost of meals was taken as 90 cents per man per day. The allowance for deck and engine stores was taken as \$6,000 for the 580-foot

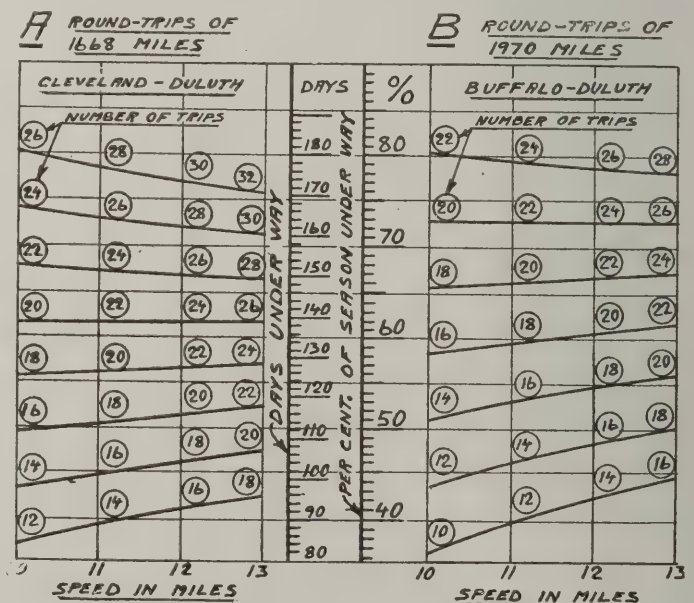


Fig. 4.—Number of Round Trips During a Season (Assumed to Be 225 Days) at Different Percentages of Time Under Way

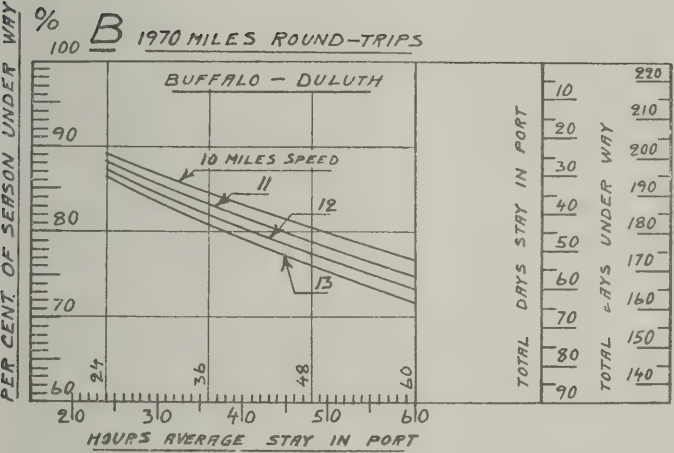
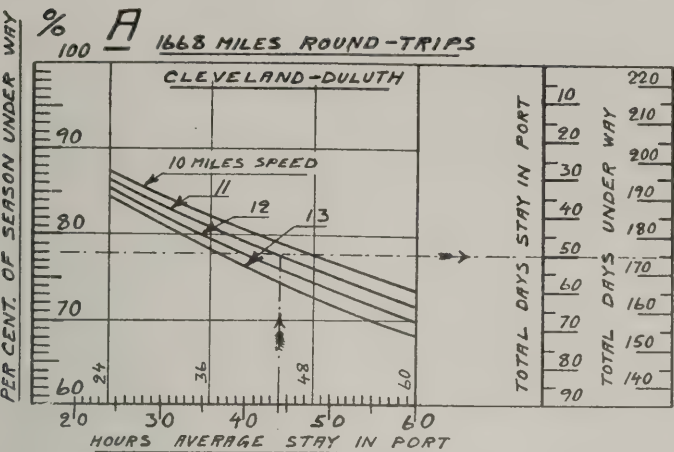


Fig. 5.—Time Under Way at Different Lengths of Stay in Port

ship, \$5,000 for the 504-foot and \$4,000 for the 420-foot ship. For each ship an amount of \$5,000 per season was added to cover management and overhead expenses.

The rate of insurance was taken as 4½ percent for the

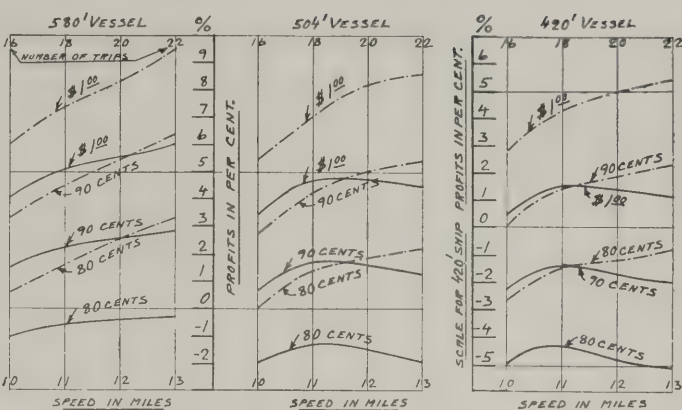


Fig. 7.—Effect of Different Rates on Iron Ore (No Coal or Grain Cargoes). Price for Bunker Coal per Ton, — — — \$4.00, — — — \$8.00

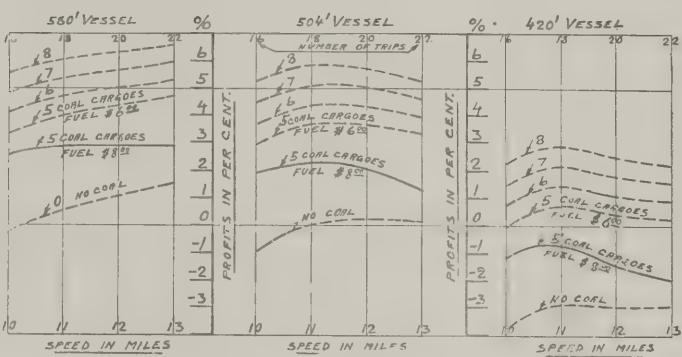


Fig. 8.—Coal Cargoes

Kind of Cargo and Rate	Number of Cargoes			
	10	11	12	13
Iron ore at 80 cents per ton.....	16	18	20	22
Coal at 45 cents per ton.....	As indicated above			

total season, and the vessels were assumed to be insured to their full value as given in Table I. The charge for depreciation, repairs, and upkeep has been figured at 7.5 percent per annum of the first cost of the ships. The policy

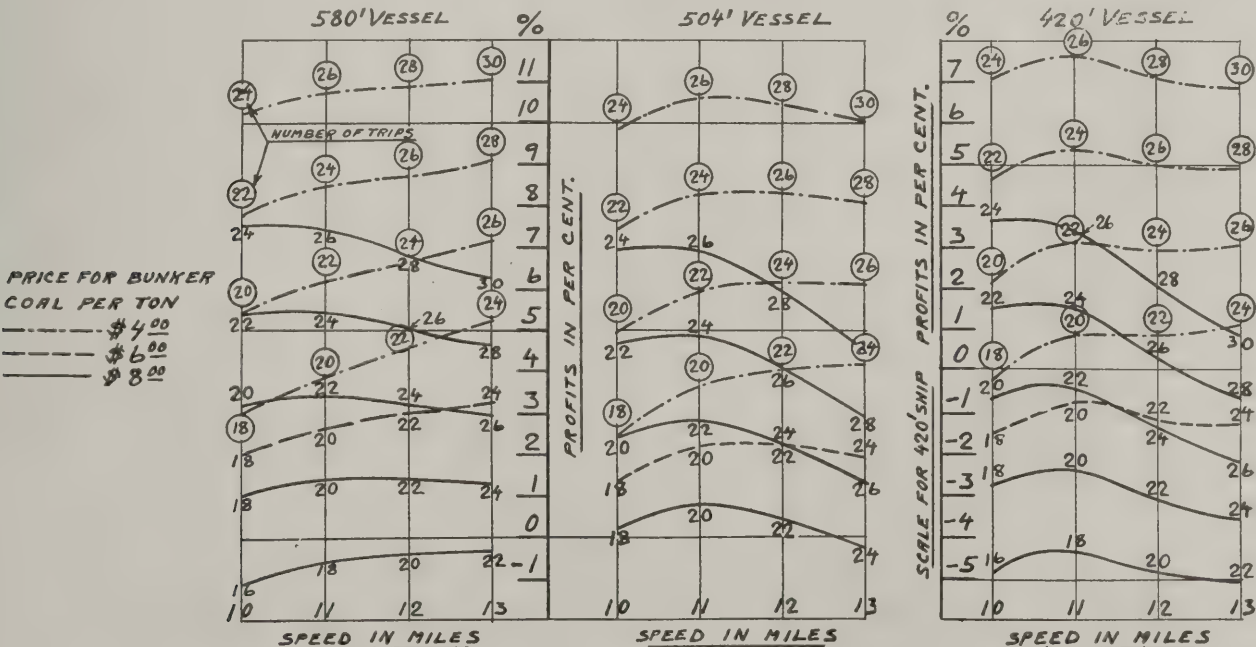


Fig. 6.—Effect of Different Number of Trips with Iron Ore (No Coal or Grain Cargoes). Ore Rate 80 Cents per Ton

among shipowners on the lakes, however, is to be satisfied with a smaller percentage of depreciation.

In Fig. 13 the different items are shown as percentages of the total expenses, and Table III gives the corresponding figures in tabular form.

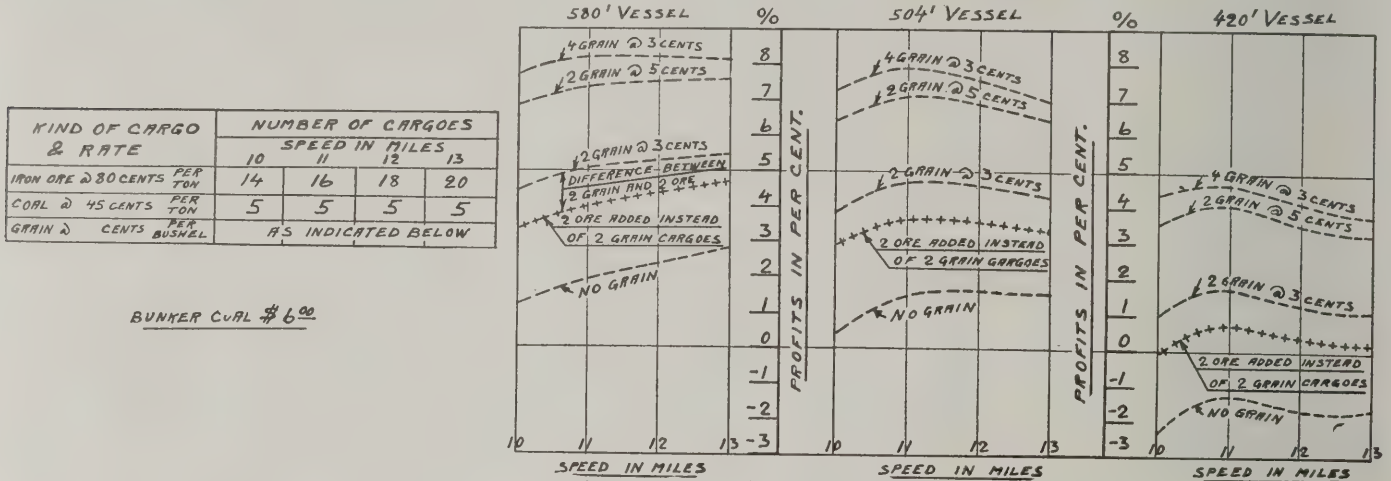
DISCUSSION OF THE RESULTS

The calculations show that the 420-foot ship has a very much lower earning capacity than a vessel of larger size

the calculations, say, for example, between a speed of 13 and 12 miles an hour. Figs. 4 and 5 indicate that, if the average detention in port is very long, it is not possible for vessels of higher speed to increase the number of trips sufficiently to meet the requirement that a speed difference of one mile an hour will make a difference of two trips during the season.

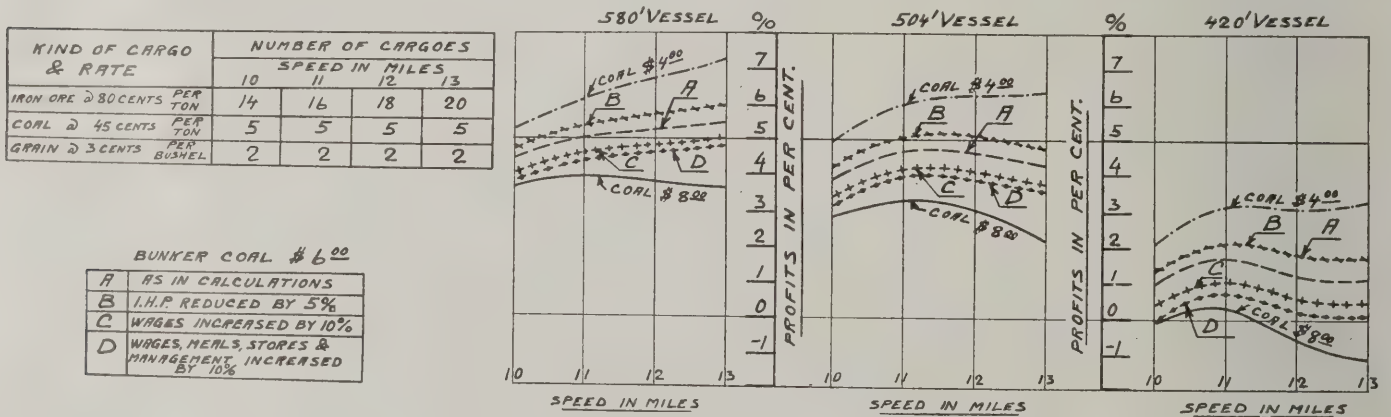
DETENTION IN PORT

Table II gives the average stay in port for vessels be-



with a length of 504 feet to 580 feet. All the smaller freighters on the Great Lakes are old, and they are built at a cost very much below the present prices. They have probably been written down to a small value in the books of the owners, and the depreciation and insurance charges can therefore be reduced to rather small amounts. For this reason they may still earn money when new vessels of the

longing to the Pittsburgh Steamship Company.* It shows that the delay in port has varied for these vessels from 25 hours and 27 minutes during the season of 1915 to 44 hours and 3 minutes during 1920—a difference of 18 hours and 36 minutes. From Fig. 5 it will be seen that this means that the vessels in the latter case had to spend in port from 7 to 9 percent more of the total time of the whole



same dimensions would not be able to make any reasonable profits.

There is not much difference in earning capacity between the 504-foot and the 580-foot ship. The 580-foot ship shows slightly better results when the price is low for bunker coal. Figs. 11 and 12 indicate that a vessel of about 540 feet length in most conditions will be very nearly as economical as the 580-foot vessel.

SPEED

From Fig. 6 it will be found that if a vessel with a speed of 11 miles an hour is not able to make two trips more during each season than a ship of 10 miles speed, then there will be a lower profit on the former vessel. The same is also true for a comparison between other speeds used in

season; in other words, the steaming time was reduced by this amount. Fig. 4 indicates that such a reduction would cut down the number of possible trips during one season to from two to four trips, depending on the speed of the ship and the distance between the ports. A change of about 8 hours in the average stay in port will, for a steamer of 11 miles speed, make a change of one trip in the total number of trips during a season.

It is evident from Fig. 6 that even a small decrease in the number of trips may seriously affect the financial result for the whole season. It is then clear that it is of uttermost importance for the lake freighters to keep the time in port down to a minimum.

*See page 183, Annual Report, Lake Carriers' Association, 1922.

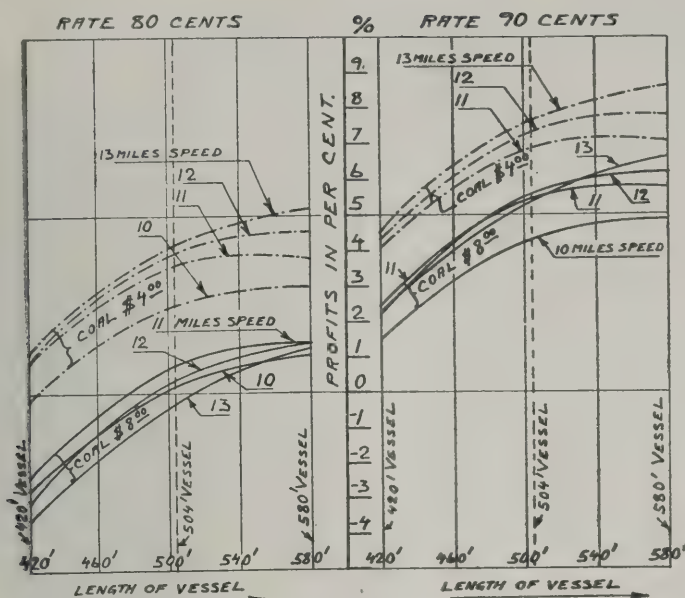


Fig. 11.—Iron Ore Cargoes (No Coal or Grain Carried)

Speed in miles	10	11	12	13
Number of cargoes	18	20	22	24

KINDS OF CARGOES

Iron Ore: The lake freighters always derive the main part of their income from the iron ore shipments. Fig. 6 shows how the profit will change with the numbers of the ore cargoes, and Fig. 7 indicates how different rates on iron ore will affect the earning capacity. See also Figs. 11 and 12.

Coal: As previously mentioned, it is not common that these vessels carry coal cargoes up to the head of the lakes on more than about one-half to one-third of the number of the westward trips. Fig. 8 shows that these coal cargoes are, however, of great importance to the economy of the vessels, in spite of the fact that the coal rate is, in general, only about half that of the ore rate. No extra expenses are in-

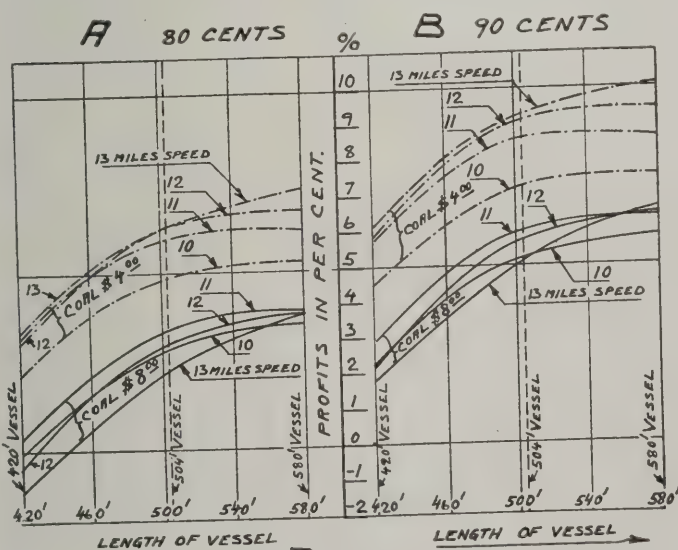


Fig. 12

Kind of Cargo and Rate	Number of Cargoes			
	Speed in Miles			
	10	11	12	13
Iron ore at				
A 80 cents per ton.....	14	16	18	20
B 90 cents per ton.....				
Coal at 45 cents per ton.....	5	5	5	5
Grain at 3 cents per bushel.....	2	2	2	2
Price for bunker coal per ton.....	— . — . — \$4.00 — . — . — \$8.00			

curred directly for them, because the ships must in any case go up to the ports on Lake Superior even if they cannot secure any cargoes for this part of the trips.

The loading and unloading of coal cargoes takes longer time than the handling of iron ore cargoes. There is thus always a considerable delay in the ports when the former kind of cargoes is carried, and this should be kept in mind when considering the relative merits between taking coal cargoes or going up the lakes in the light condition.

Grain: In Fig. 9 some diagrams are drawn showing how the grain cargoes will influence the earnings. If at the assumed conditions, as stated in the diagram, two cargoes of grain are carried instead of two ore cargoes, it will be seen that, at a rate of 3 cents a bushel, the grain cargoes will increase the profits for the whole season approximately 1 percent. Should a rate of 5 cents per bushel be obtained, the profits would be increased by about 2.9 to 3.6 percent.

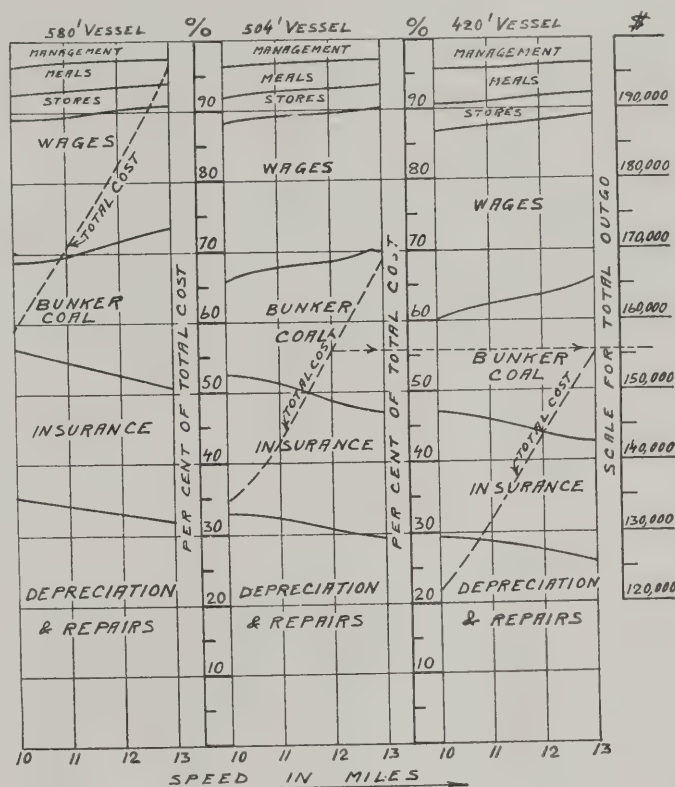


Fig. 13.—Cost of Operation

Speed in miles	10	11	12	13
Number of trips	16	18	20	22
Bunker coal at \$6.00				

As previously referred to, there is very often a serious delay at the grain elevators. If for this reason a ship would lose one more trip with iron ore, there would, with a rate of 3 cents a bushel for the grain, be no extra profits gained by taking the two cargoes of grain instead of three cargoes of iron ore. It is therefore rather common that the vessel owners in their grain contracts require a dispatch guaranty of \$1,000 to \$1,500 a day for each day a vessel is held in port beyond three days.

Fig. 9 clearly demonstrates that a high grain rate for only one or two trips may materially increase the profits for the entire season.

WAGES, MEALS, STORES, ETC.

In Fig. 10 is shown how a change in these factors may affect the results. It will be seen, for example, that an increase of wages of 10 percent will, for the conditions stated in the figure, reduce the profits from about 0.5 to 1 percent for the 580-foot vessel to about 0.7 of 1 percent

for the 420-foot vessel. An increase of 10 percent in the total expenses of wages, meals, stores, and management will cut down the profits for the 580-foot vessel about 0.7 of 1 percent as compared with about 1 percent for the 420-foot vessel. In other words, the larger ships will suffer less from an increase in the running cost than the smaller ships.

REDUCTION IN HORSEPOWER

In order to investigate to what extent a saving could be effected if forms of less resistance were designed, I have made some calculations based on horsepower 5 percent less than given by the curves in Fig. 3 on which my other calculations are based. They are plotted in Fig. 10. It will be seen that there is an actual gain in profits varying from 0.3 to 0.7 of 1 percent when the price for bunker coal is \$6. For a higher coal price the profits will, of course, be even further increased.

OTHER TYPES OF MACHINERY

With turbine machinery, a coal consumption of 1.2 pounds per indicated horsepower has been assumed. The coal price was taken as \$6 per ton. Against the saving of fuel has

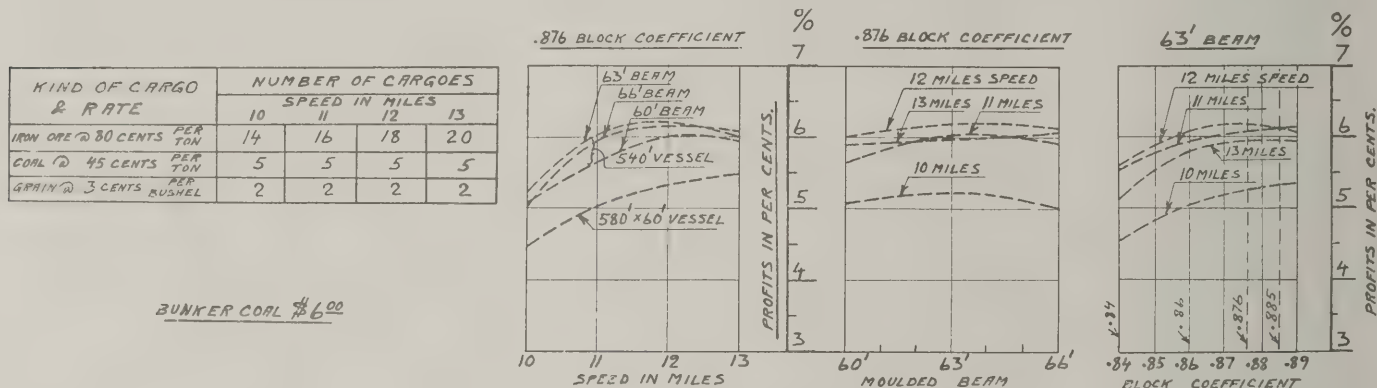


Fig. 14.—540-Foot Vessel

to be set the 12 percent charge for depreciation, upkeep, and insurance on the addition of the first cost of the more expensive turbine. It was found that, in order not to increase the cost of operation, the first cost of the turbine machinery must not be more than \$35 per indicated horsepower above that of the reciprocating machinery. In other words, the turbine machinery had to cost less than \$80 to \$85 per indicated horsepower to be able to compete with the reciprocating engine.

For shipowners contemplating the building of new ships, the following points are, I believe, of special interest. They sum up, in a way, the results of the investigation.

1. Of vessels of ordinary proportions the 580-foot vessel is, in general, the best. One of 540-foot length is, however, very nearly as economical as the larger ship. A 540-foot vessel can with advantage be designed with a beam of about 63 feet. Fig. 14 indicates that such a vessel will be more economical than the present 580-foot vessels. For a 540-foot ship it seems to be best to adopt a block coefficient of about 0.875.

2. The available draft in the channels will undoubtedly in the future be increased. In order to take full advantage of an increase in the draft it will be necessary to construct the vessels with greater molded depth than at present. For a 540-foot vessel a molded depth of about 32 feet can probably be adopted.

3. With the present high coal prices it is not economical to increase the speed above 11½ to 12 statute miles (10 to 10.4 knots).

4. Owing to the higher first cost and the short season there seems, at present, to be no reason for experimenting with other types of drive such as turbines and Diesel engines.

Steam-Line Filters

(Continued from page 746)

there are 100 packs in a filter, and that only 1 percent at a time is necessary for clearing out the deposit or residuum, it is obvious that an increase of 1 percent of the filter is sufficient to effect continuous complete filtration. As a rule, with ordinary filters an increase of 100 percent, that is double the capacity of filter, is required to obtain these results.

It is quite immaterial, except for purposes of convenience, in what position the packs are placed, and filtration is effected quite as well horizontally as vertically. The illustration shows the end and side elevation of a filter of the horizontal type, the disposition of the packs in this case being easily understood. There are 24 packs each 6 inches in length, each containing about 1,400 sheets; the whole filter thus contains approximately 34,000 sheets. As each separate pack is capable of filtering 50 gallons an hour, the whole filter will deal with 1,200 gallons an hour, or nearly 5½ tons an hour. The reason of the large discharge from a filter of comparatively small size can be understood from an example. Assum-

ing the sheets to be so perforated as to contain 40 sources and sinks, that is 40 complete filtering units, there are obviously in the above example nearly one and a-half million units, or separate sources and sinks, continuously contributing their quota of filtration.

It is evident that the power required is not very great, since without considering losses, that is assuming efficiency of unity, filtration would be effected by a pump and motor of little more than ⅓ horsepower.

The natural inquiry of prospective users of the filter is as to the life of the paper employed for filtration. It must be remembered that the passage of the liquid between the sheets, i.e., through the films, is slow, and there is practically no wear from this cause. As far as any other deterioration goes, up to the present, experience shows that neither water, oil, paraffin, nor even weak acid solutions seem to have the slightest effect on the paper, which, as it is waterproof and oilproof, appears to be capable of being employed successively for a number of purposes, as long as it is washed through before use with each different substance.

Dr. Hele-Shaw said further that the operation of the filter showed that no trace of solid matter penetrated between the sheets and that grit never passed between them. There was only a stream-line film of liquid between the surfaces and, consequently, it could not be conceived that these surfaces would wear out.

Various mixtures and solutions have been experimented with. With a mixture of dirty oil and water (bilge water) the oil took up the dirt and the dirt and oil separated from the water, but, if the oil were clean, the oil and water both came through the filter together and afterwards immediately separated.

Failure of Condenser Tubes*

By William R. Webster†

Both tube makers and tube users have given much consideration to the problem of providing and securing tubes which would give maximum length of service, but due to the erratic nature of corrosive attack and the large element of time involved, it cannot be said that sufficient facts have been established on a basis of scientific procedure to make it at this time possible for anyone within certain very broad limits to predict with certainty that any particular lot of tubes will endure under average service conditions in a measurably superior degree to some other tubes differing from them in material respects. Since the matter is one of very great importance in the conduct of power installations, careful study of the problem in all of its aspects is well warranted in the interest of good engineering practice.

FEW problems relating to the operation of steam power plants, both marine and stationary, involve greater perplexities than those surrounding the endurance of the tubes employed in surface condensers where salt or contaminated cooling water is used. Failures experienced are of two kinds. One is due to spontaneous longitudinal splitting of the tube which is an exhibition of the phenomenon known as season cracking. The other is caused by the corrosive attack of the cooling water or of substances carried by it. In point of frequency of occurrence, the former is now of relatively minor importance, but because of the fact that when it is encountered it involves sudden and extensive leakage, its immediate results may be of greater consequence than failure due to corrosion because the latter is gradual in approach and manifestation.

COMPOSITION OF TUBES

Originally most condenser tubes were made of a mixture of about 70 percent of copper and 30 percent of zinc, this composition being dictated by considerations affecting the manufacture rather than the performance of the tubes. Experience having demonstrated that the presence of a small amount of tin retarded the corrosive effects of sea water, some experiments were made in which one percent of tin was substituted for 1 percent of zinc, with the result that superior resistance to corrosion was obtained. This specification was originally adopted by the British Admiralty since which time the term "Admiralty mixture" or metal has been employed to designate it.

It was stated above that season cracking was a recognizable cause of tube failure. For this a complete and sufficient remedy is a moderate degree of annealing. It was originally the practice to furnish condenser tubes hard, i.e., without any final heat treatment. No way is known to the art by which tubes so made can be positively assured against this trouble. On the writer's recommendation, the Bureau of Steam Engineering of the Navy Department somewhat over 20 years ago adopted specifications requiring that tubes be annealed after the final drawing operation. This practice has since become standard in this country although English manufacturers still continue to omit a final annealing.

The Admiralty mixture is hot short and can consequently not be made into tubes by the customary method of hot piercing a solid billet or blank. Instead the usual practice is to make the initial casting in the shape of a hollow cylinder. To form this, appropriate amounts of copper, zinc and tin, together with a suitable quantity of scrap, are brought to a molten state and then poured into a vertically disposed cylindrical mold of cast iron in the center of which a cylindrical sand core is supported.

Only the highest grades of material obtainable are employed. While the impurities carried by slightly lower

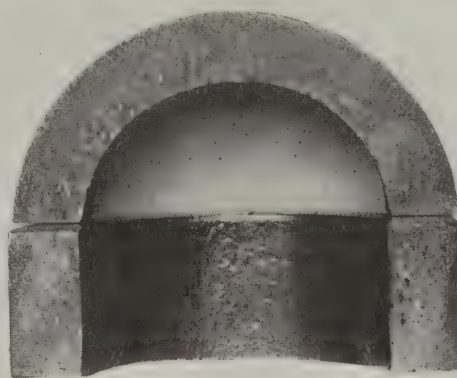
grades have never been proved to have an effect on service endurance they do affect the ductility of the material and cause a resulting increase in its cost of manufacture entirely out of proportion to any saving in initial cost.

Lead and iron are considered deleterious impurities. In excess both hamper the operations of the tube maker, and the latter in particular is believed to assist the attack of corrosive agencies. The effect of such other impurities as normally exist in well made brass has not been shown to be of material consequence.

Objection is sometimes made to the use of scrap, but if it is understood that the term scrap is not synonymous with junk and that an inferior mixture results if too large a proportion of elemental metals be employed, no grounds for such objection exist.

PROCESS OF MANUFACTURE

The resulting casting, or shell, about 4 inches in outside diameter by $\frac{5}{8}$ inch thick by 50 inches long, is by a succession of cold drawing operations reduced to a tube having



Longitudinal and Cross Section of an Acceptable Shell Casting

a cross sectional area of about 0.15 square inch involving an extension of each element of the original casting of 40 to 50 times. The severity of the first drawing operation is such that metal of an inferior quality, either due to unskillful casting or deleterious impurities, is unable to withstand it and breakage inevitably results. As the drawing operations continue, the tube becomes too long for convenient handling so that it is cut into appropriate lengths from time to time. Departure from the cast state increases the normal ductility of the metal somewhat so that later reductions are correspondingly greater than the initial ones.

IMPORTANCE OF ANNEALING

The annealing operation to which the tube is subjected is an important one since the ductility of the metal is within limits a function of the temperature to which it is heated

*From a paper on "Condenser Tubes" presented before the Metropolitan Section of the American Society of Mechanical Engineers in New York on November 8.

† Vice-president, Bridgeport Brass Company, Bridgeport, Conn.

in the process. Since annealing is employed for the purpose of removing the hardening and embrittlement due to drawing, it is manifest that it should be so governed as to produce maximum ductility. Careful pyrometric control is therefore essential to good practice in this respect.

It was heretofore stated that one of the causes of tube failure was due to a phenomenon known as season cracking which could be prevented by annealing after the final drawing operation. By properly governing the drawing operations the tendency to season crack can be controlled to some degree, but it cannot by this means alone be eliminated with certainty.

Since a condenser tube when fully annealed is so soft as to be readily distorted by treatment incident to handling and installation, it is customary practice to modify the final

experience does not indicate that it is of much consequence on the whole in preventing corrosive attack. The belief is very widely held that the control of annealing temperatures within close limits and extreme freedom from mechanical defects are essential to satisfactory endurance. In the former case, fortunately, ample evidence is available and merely lacks sufficient examination. The tubes in a condenser usually fail in succession, some giving a much longer life than others. Such failures must be due to causes either internal or external to the tubes. The latter in individual condensers do not usually vary greatly from tube to tube and when differences in this respect do occur, they can usually be detected. Under these circumstances, when variations in detectable internal conditions exist a sufficiently large number of observations should be able to determine with certainty any relation existing between any specific internal condition and superior or inferior service endurance.

For example, if a small crystal structure is more conducive to long life than one relatively large, the earlier failures in an individual condenser will be found upon examination to possess, on the average, larger crystals than those which fail subsequently, with some degree of proportionality observable between the crystal size and the life of the tube. Comparative examinations of large quantities of failed and unfailed tubes from the same condensers, while always showing variations in crystal size of considerable amounts, have not given the slightest support to this belief.

Similarly, attempts to explain observed failures by the presence of mechanical imperfections have been unfruitful. Dr. G. D. Bengough, in discussing this factor, has stated that "in my (his) experience it is very rare for tubes to fail from this cause." Should, however, the facts above mentioned be admitted by all, that alone would contribute but little to the solution of the problem of condenser tube failure. On the other hand, if such admission should serve to direct attention to the importance and necessity of more intensive study of the causes of corrosion which reside within the condenser, much would have been accomplished in the direction of substantial progress.

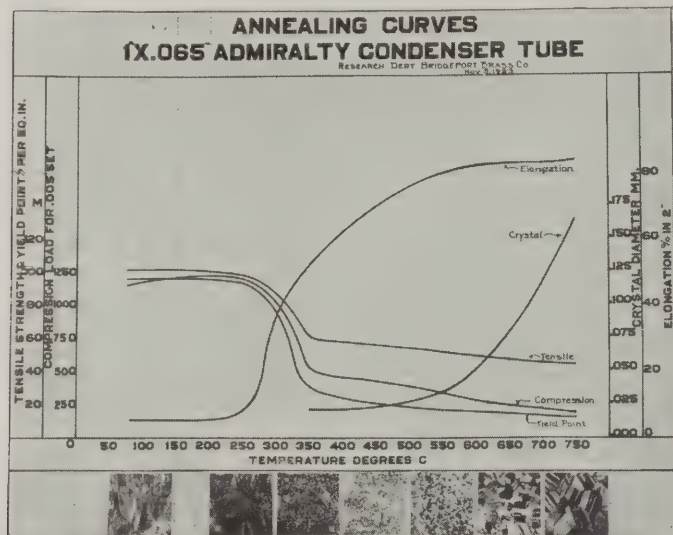
A discussion of the precise mechanism of the corrosive attack involved in the failure of condenser tubes is beyond the scope of this paper. Suffice it to say, therefore, that the corrosive agencies existing in the average surface condenser using sea water are sufficiently active to make the destruction of any brass tube only a question of time, and that the reason why brass tubes last on the whole as well as they do is that corrosive action is usually accompanied by the formation of by-products which are distinctly protective. Specifically, if a piece of condenser tube be immersed in warm salt water containing air bubbles, corrosive attack will continue for a considerable period at a rate sufficient to completely dissolve it in a very few months. Also corrosive attack of a character not involving the formation of a protective coating may occur under perfectly normal conditions and proceed at a rate sufficiently rapid to perforate the tube in a few weeks.

PLUG TYPE DEZINCIFICATION

Investigations of the subject of condenser tube corrosion have established the existence of a considerable number of distinctive types of attack. Probably the most troublesome is that usually known as "plug type dezincification," wherein approximately circular areas of the tube wall of small size are so attacked that the zinc appears to have been dissolved out, leaving a spongy mass or plug of copper behind.

This action once set up continues at a rapid rate until the wall of the tube is perforated. The spongy copper is not strongly adherent, and frequently falls or is washed out of place, leaving an approximately circular hole.

This type of corrosion is the one which usually accounts for the rapid failure of new tubes. Perforations from this



Curve Showing Relation Between Annealing Temperature, Physical Properties and Crystalline Structure of a Condenser Tube

anneal to a degree that will, while removing all liability to season cracking, still leave the tube hard enough to withstand handling.

The metallurgical microscope is an extremely useful instrument for determining whether the annealing operation has been so conducted as to prevent season cracking on the one hand and undue pliability on the other, but its value as a means of predicting service endurance has not been established by any well attested record of experience.

FAILURE DUE TO SEASON CRACKING

It will be at once evident that failure due to season cracking is readily and completely avoidable, since the degree of annealing necessary to prevent it is well below the point at which the metal becomes unduly soft. In order to guard against this latter possibility it has sometimes been thought necessary to require that a unit length of the tube be capable of sustaining a specific load applied perpendicularly to its axis without taking a permanent set exceeding a certain amount. As the size of the crystals of the tube can be determined microscopically with a fair degree of approximation and since this size is proportionate to the softness of the tube, this requirement is unnecessary in the presence of a definite limit for the crystal or grain size. In this connection, however, it is desired to call attention to the fact that the factor of observational error involved in the measurement of crystal size is a large one.

FACTORS AFFECTING ENDURANCE

While perfection of manufacturing practice may well be stressed as of importance in the way of good workmanship,

PREVENTATIVE MEASURES

In general tubes should be cleaned as frequently as possible, particularly when first installed. Deposits of foreign matter, especially when foul water is used, are frequently of a highly corrosive nature. In the writer's experience iron protective plates properly attached to the tube sheets have a distinct value and should always be employed. The omission of the final pickling operation so as not to disturb the oxide scale formed in the final anneal has been recommended by a distinguished authority. Experimental observations indicate that it is well worthy of extended trial.

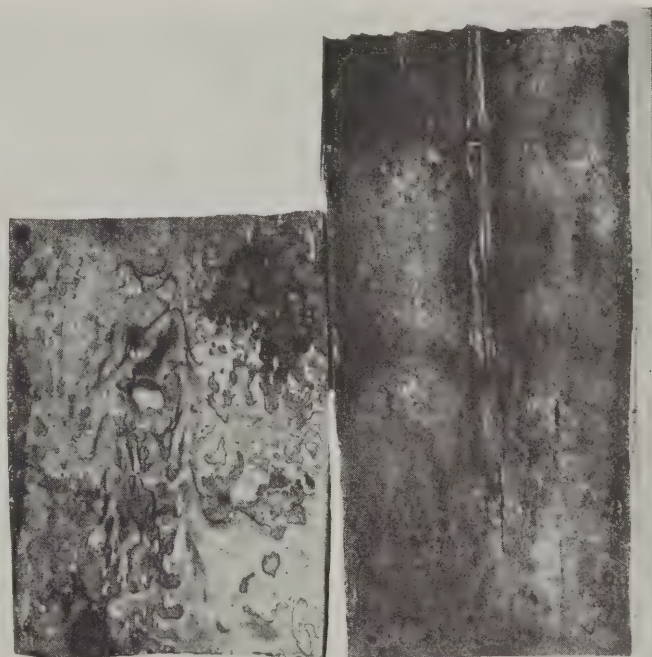
This discussion heretofore has concerned itself only with tubes of Admiralty mixture as their use is indicated in most cases where corrosive action is to be expected. In installations employing uncontaminated fresh water Muntz metal gives satisfactory results. This mixture, which is approxi-

**Inside Surface of Tube, Showing Plug Type Dezincification.
The Tube Has Been Split Longitudinally**

cause may take place within a few months or even weeks from the time the tubes are installed. The chemical reactions involved are complex but appear to be favored by a high degree of salinity. Frequently the attack occurs along the bottom element of the tube under conditions indicating that, when drained, water has collected in the bottom and that concentration due to evaporation has occurred. Attempts to produce this action experimentally have not been entirely conclusive. A slight inclination of the condenser so that the tubes will drain dry and the avoidance of sagging appear to have value as preventive measures, and should always be adopted. Frequent thorough cleaning of the tubes when new is also desirable, particularly if the condenser is out of service for extended periods.

Under certain circumstances a type of corrosion resembling this is encountered which differs from it in that the action instead of being localized occurs quite regularly throughout the entire wall of the tube and proceeds at a much slower rate until the whole tube becomes brittle and lacking in strength. This is observed usually only in installations that have been in operation for many years although Muntz metal tubes generally fail in sea water from this cause in a relatively short time.

Quite frequently failures occur from an action as a result of which the wall of the tube is dissolved in an irregular manner, sometimes involving extensive areas and sometimes quite restricted ones. Continuous action of this character usually reduces the thickness of the tube particularly at and near the inlet end so that the packing no longer functions although it frequently localizes in a way that produces perforation without much thinning of the adjacent portions. Dr. Bengough has investigated this type of failure and proved conclusively that it is due to the presence of entrained air in the condensing water. This may be due to



Sections of Condenser Tube, One Part of Which Has Been Perforated Due to Entrained Air Corrosion; the Other Portion of Which, While Entirely Free from Attack, Shows a Large Spill

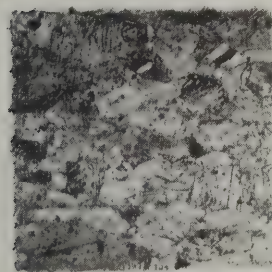
mately 60 percent copper and 40 percent zinc, is inherently cheaper than Admiralty and the process of manufacture less costly, due to the fact that it is capable of being worked hot.

The writer has for years vigorously opposed the contentions of those who hold the belief that crystalline structure or mechanical imperfections are causative accompaniments of corrosive attack, and in support of his position has presented evidence and cited authority. The attitude is and was not dictated by any lack of appreciation of the importance of these factors from the standpoint of good workmanship and practice, but results solely from the conviction that as long as their suspected presence is assumed to account for premature failures the sufficient remedy for which lies in increased severity of inspection, no progress in determining and controlling the factors depending on condenser design and operation is to be expected.

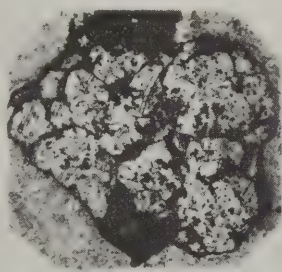
SPECIFICATIONS

Engineers in the endeavor to avoid the very serious difficulties incident to the premature failure of tubes in service have exhibited considerable ingenuity and industry in drawing exacting and conflicting specifications. It can, however,

(Continued on page 783)



**Structure of Tube
Which Gave an Ex-
traordinary Life**



Copper Plug Magnified

various causes such as improper design of circulating pumps, leaks in the suction line or disturbances in the vicinity of the intake. He recommends soaking the tubes in quiescent sea water at 40 degrees C. for about a week. This appears to form a protective coating.

Applications of Arc Welding to Ship Construction—V

Tables Showing Time Required for Various Type Electric Welded Joints as Compared with Riveted Construction

By E. H. Ewertz*

IN comparison with riveted construction, the use of electric arc welding in ship work shows a reduction in weight and a saving in the time element—with consequent savings in cost. Instances have previously been mentioned in this series of articles where weight in hull construction has been reduced over 25 percent while the hours of labor have been cut 20 percent. Examples are also mentioned in cross channel barge assembly where 245 man-hours were saved in the construction and more than 1,000 pounds of metal saved by utilizing welding instead of riveting. The tabulations in this installment deal mainly with the time factor in connection with ship welding.

COST SAVINGS OF WELDING

The cost saving element of welding in ship work has already been discussed in the analysis of the work on cost data as carried out under the supervision of Mr. W. S. Wakeman, general manager of the Fore River Plant of the Bethlehem Shipbuilding Corporation. The results of the investigations were published in Tables 1 to 10 on pages 628-629 of the

October issue of MARINE ENGINEERING AND SHIPPING AGE.

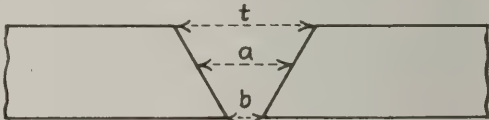
Reference was also made on page 628 to Tables 12 to 24 which appear below as showing in tabulated form the time required to weld seams and holes. As can readily be understood, precautions were taken in making the tests to be certain that operators were competent and that the best of material and equipment were used. The work was done by both the

TABLE 12.—To convert time required for one size welding wire to that required for another size

Time for $\frac{1}{8}$ inch to that for $\frac{5}{32}$ inch; multiply by	.64
Time for $\frac{1}{8}$ inch to that for $\frac{3}{16}$ inch; multiply by	.444
Time for $\frac{1}{8}$ inch to that for $\frac{1}{4}$ inch; multiply by	.25
Time for $\frac{5}{32}$ inch to that for $\frac{1}{8}$ inch; multiply by	1.56
Time for $\frac{5}{32}$ inch to that for $\frac{1}{4}$ inch; multiply by	.39
Time for $\frac{3}{16}$ inch to that for $\frac{1}{8}$ inch; multiply by	2.25
Time for $\frac{3}{16}$ inch to that for $\frac{5}{32}$ inch; multiply by	1.44
Time for $\frac{1}{4}$ inch to that for $\frac{1}{8}$ inch; multiply by	.56
Time for $\frac{1}{4}$ inch to that for $\frac{3}{16}$ inch; multiply by	4.00
Time for $\frac{1}{4}$ inch to that for $\frac{5}{32}$ inch; multiply by	2.56
Time for $\frac{1}{4}$ inch to that for $\frac{3}{16}$ inch; multiply by	1.78

TABLE 13.

Having measured the distance across bottom and top of seam to be welded this table gives the average distance across seam in decimals. Enter Table 14 with this average distance (a) to get minutes per foot



Thickness of Stock in Inches

	0	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2
	Average distance (a).															
$\frac{1}{8}$	.06	.09	.12	.16	.19	.25	.31	.37	.44	.5	.56	.62	.69	.75	.81	.87
$\frac{1}{4}$	.12	.16	.19	.22	.25	.31	.37	.44	.5	.56	.62	.69	.75	.81	.87	.94
$\frac{3}{8}$	.19	.22	.25	.28	.31	.37	.44	.5	.56	.62	.69	.75	.81	.87	.94	1.
$\frac{1}{2}$	.25	.28	.31	.34	.37	.44	.5	.56	.62	.69	.75	.81	.87	.94	1.	1.06
$\frac{5}{8}$	.31	.34	.37	.41	.44	.5	.56	.62	.69	.75	.81	.87	.94	1.	1.06	1.12
$\frac{3}{4}$	.37	.41	.44	.47	.5	.56	.62	.69	.75	.81	.87	.94	1.	1.06	1.12	1.19
$\frac{7}{8}$	.44	.47	.5	.53	.56	.62	.69	.75	.81	.87	.94	1.	1.06	1.12	1.19	1.25
1	.5	.53	.56	.59	.62	.69	.75	.81	.87	.94	1.	1.06	1.12	1.19	1.25	1.31
$1\frac{1}{8}$	.56	.59	.62	.66	.69	.75	.81	.87	.94	1.	1.06	1.12	1.19	1.25	1.31	1.37
$1\frac{1}{4}$	.62	.66	.69	.72	.75	.81	.87	.94	1.	1.06	1.12	1.19	1.25	1.31	1.37	1.44
$1\frac{3}{8}$	.69	.72	.75	.78	.81	.87	.94	1.	1.06	1.12	1.19	1.25	1.31	1.37	1.44	1.5
$1\frac{1}{2}$	.75	.78	.81	.84	.87	.94	1.	1.06	1.12	1.19	1.25	1.31	1.37	1.44	1.5	1.56
$1\frac{5}{8}$	.81	.84	.87	.91	.94	1.	1.06	1.12	1.19	1.25	1.31	1.37	1.44	1.5	1.56	1.62
$1\frac{3}{4}$	.87	.91	.94	.97	1.	1.06	1.12	1.19	1.25	1.31	1.37	1.44	1.5	1.56	1.62	1.69
$1\frac{7}{8}$	.94	.97	1.	1.03	1.06	1.12	1.19	1.25	1.31	1.37	1.44	1.5	1.56	1.62	1.69	1.75
2	1.	1.03	1.06	1.09	1.12	1.19	1.25	1.31	1.37	1.44	1.5	1.56	1.62	1.69	1.75	1.81
$2\frac{1}{8}$	1.06	1.09	1.12	1.16	1.19	1.25	1.31	1.37	1.44	1.5	1.56	1.62	1.69	1.75	1.81	1.87
$2\frac{1}{4}$	1.12	1.16	1.19	1.22	1.25	1.31	1.37	1.44	1.5	1.56	1.62	1.69	1.75	1.81	1.87	1.94
$2\frac{3}{8}$	1.19	1.22	1.25	1.28	1.31	1.37	1.44	1.5	1.56	1.62	1.69	1.75	1.81	1.87	1.94	2.
$2\frac{1}{2}$	1.25	1.28	1.31	1.34	1.37	1.44	1.5	1.56	1.62	1.69	1.75	1.81	1.87	1.94	2.	2.06
$2\frac{5}{8}$	1.31	1.34	1.37	1.41	1.44	1.5	1.56	1.62	1.69	1.75	1.81	1.87	1.94	2.	2.06	2.12
$2\frac{3}{4}$	1.37	1.41	1.44	1.47	1.5	1.56	1.62	1.69	1.75	1.81	1.87	1.94	2.	2.06	2.12	2.19
$2\frac{7}{8}$	1.44	1.47	1.5	1.53	1.56	1.62	1.69	1.75	1.81	1.87	1.94	2.	2.06	2.12	2.19	2.25
3	1.5	1.53	1.56	1.59	1.62	1.69	1.75	1.81	1.87	1.94	2.	2.06	2.12	2.19	2.25	2.31
$3\frac{1}{8}$	1.56	1.59	1.62	1.66	1.69	1.75	1.81	1.87	1.94	2.	2.06	2.12	2.19	2.25	2.31	2.37
$3\frac{1}{4}$	1.62	1.66	1.69	1.72	1.75	1.81	1.87	1.94	2.	2.06	2.12	2.19	2.25	2.31	2.37	2.44
$3\frac{3}{8}$	1.69	1.72	1.75	1.78	1.81	1.87	1.94	2.	2.06	2.12	2.19	2.25	2.31	2.37	2.44	2.5
$3\frac{1}{2}$	1.75	1.78	1.81	1.84	1.87	1.94	2.	2.06	2.12	2.19	2.25	2.31	2.37	2.44	2.5	2.56
$3\frac{5}{8}$	1.81	1.84	1.87	1.91	1.94	2.	2.06	2.12	2.19	2.25	2.31	2.37	2.44	2.5	2.56	2.62
$3\frac{3}{4}$	1.88	1.91	1.94	1.97	2.	2.06	2.12	2.19	2.25	2.31	2.37	2.44	2.5	2.56	2.62	2.69
$3\frac{7}{8}$	1.94	1.97	2.	2.03	2.06	2.12	2.19	2.25	2.31	2.37	2.44	2.5	2.56	2.62	2.69	2.75
4	2.	2.03	2.06	2.09	2.12	2.19	2.25	2.31	2.37	2.44	2.5	2.56	2.62	2.69	2.75	2.81

Distance (t) across top of seam.
Distance (b) across bottom of seam, in inches.

*General manager, Moore Plant, Bethlehem Shipbuilding Corporation, Ltd., Elizabeth, N. J.

General Electric Company and the Lincoln Electric Company machines and bare electrodes employed in all instances.

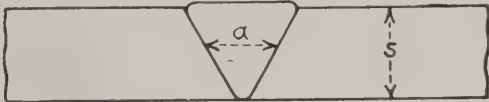
PROPER DESIGN OF JOINTS NECESSARY FOR WELDING

It is certain that considerable saving can be made by the use of the electric arc welding method if the joints are designed for this purpose, and from the little data given, it is

A vast number of strength tests of welded joints as well as similar joints riveted have been made by the Government as well as by societies, manufacturers of welding machines, manufacturers of electrodes, and by private individu-

TABLE 14.

Actual minutes required to weld one foot of seam, flat and backed.
This does not include time for incidental work, such as handling.



Average width (a) across the seam. See Table 13.

Thickness of Stock in Inches
Minutes to Weld One Foot of Seam

	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
.1	4	5	6	5	6	7	8	10	11	13	14	16	17	19	19
.2	8	10	12	10	11	14	17	20	23	26	29	32	35	38	38
.3	12	15	19	14	17	21	25	30	34	39	43	48	52	57	57
.4	16	20	25	19	22	28	34	40	46	52	58	64	70	76	76
.45	18	23	28	21	25	31	38	45	52	58	65	72	78	85	85
.5	20	25	31	24	27	35	42	50	57	65	72	80	87	95	95
.55	22	28	34	26	30	38	47	55	63	71	80	88	96	104	104
.6	23	30	37	28	33	42	51	60	69	78	87	96	105	114	114
.65	25	33	41	31	35	45	55	65	75	84	94	105	114	124	124
.7	27	36	44	33	38	49	59	70	80	91	101	112	122	133	133
.75	29	38	47	36	41	52	64	75	86	97	109	120	131	142	142
.8	31	41	50	38	44	56	68	80	92	104	116	128	140	152	152
.85	33	43	53	40	47	59	72	85	98	110	123	136	149	161	161
.9	35	46	56	43	49	63	76	90	103	117	130	144	157	171	171
.95	37	48	59	45	52	66	81	95	109	123	138	152	166	180	180
1.0	39	51	62	48	55	70	85	100	115	130	145	160	175	190	190
1.1	43	56	68	52	60	77	93	110	126	143	160	176	192	209	209
1.2	47	61	75	57	66	84	102	120	138	156	174	192	210	228	228
1.3	51	66	81	62	71	91	110	130	149	169	188	208	227	247	247
1.4	55	71	87	66	77	98	119	140	161	182	203	224	245	266	266
1.5	58	76	93	71	82	105	127	150	172	195	217	240	262	285	285
1.6	62	81	98	76	88	112	136	160	184	208	232	256	280	304	304
1.7	66	85	100	81	93	119	144	170	195	221	246	272	297	323	323
1.8	70	91	112	85	99	126	153	180	207	234	261	288	315	342	342
1.9	74	96	118	90	104	133	161	190	218	247	275	304	332	361	361
2.	78	100	125	95	110	140	170	200	230	260	290	320	350	380	380

1/8" Wire

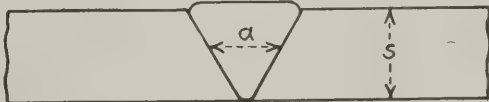
3/8" Wire

evident that a saving in material with the corresponding increase in carrying capacity is made possible in an electric welded ship.

als, and as it is only possible to give a small portion of such tests in this paper, additional information on this subject can be had from books and papers listed in the bibliography.

TABLE 15.

Actual minutes required to weld one foot of seam. This time includes all items except moving. (See Table 13.)



Average width (a) of seam in inches. See Table 13.

Thickness of Stock in Inches
Minutes to Weld One Foot of Seam

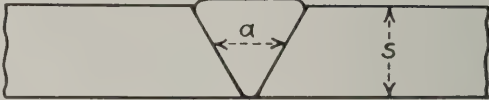
	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
.1	5	6	7	6	7	9	10	12	14	16	17	19	21	23	23
.2	9	12	15	11	13	17	20	24	28	31	35	38	42	46	46
.3	14	18	22	17	20	25	31	36	41	47	52	58	63	68	68
.4	18	24	29	23	26	34	41	48	55	62	70	77	84	91	91
.45	21	27	33	25	30	39	46	54	62	70	78	86	94	103	103
.5	23	30	37	28	33	42	51	60	69	78	87	96	105	114	114
.55	25	33	40	31	36	46	56	66	76	86	96	105	115	125	125
.60	28	36	44	34	40	50	61	72	83	94	104	115	126	137	137
.65	30	39	48	37	42	55	67	78	90	101	113	125	136	148	148
.7	32	42	51	40	46	59	71	84	97	109	121	134	147	159	159
.75	34	45	55	43	49	63	76	90	103	117	130	144	157	170	170
.8	37	48	59	46	53	67	82	96	110	125	139	154	168	182	182
.85	39	51	62	49	56	71	85	102	116	132	146	163	178	193	193
.9	41	54	66	51	59	75	92	108	124	140	156	172	189	205	205
.95	44	57	70	54	63	80	97	114	131	148	165	182	200	215	215
1.	46	60	73	57	66	84	102	120	138	156	174	192	210	228	228
1.1	51	66	81	63	73	92	112	132	152	171	191	211	231	250	250
1.2	55	72	88	68	79	101	122	144	165	187	209	230	252	274	274
1.3	60	78	95	74	86	109	132	156	179	203	226	250	273	296	296
1.4	64	83	103	80	92	117	143	168	193	218	243	269	294	319	319
1.5	69	90	110	85	99	126	153	180	207	234	261	288	315	342	342
1.6	73	95	118	91	105	134	163	192	221	250	278	307	336	365	365
1.7	78	101	125	97	112	143	173	204	234	265	296	326	357	388	388
1.8	83	107	132	102	119	151	184	216	249	281	313	343	378	410	410
1.9	87	113	140	108	125	160	194	228	262	296	330	365	400	433	433
2.	92	119	147	114	132	168	204	240	276	312	348	384	420	460	460

1/8" Wire

3/8" Wire

TABLE 16.—OVERHEAD, REINFORCED, BUTT JOINTS

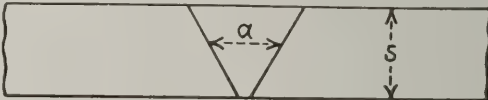
Actual minutes required to weld one foot of seam. This table includes all items except moving. (See Table 13.)



Average width (a) of seam in inches.	Thickness of Stock in Inches													
	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/4
.1	8	10	12	10	11	14	17	20	23	26	29	32	35	38
.2	16	20	25	19	22	29	34	40	46	52	58	64	70	76
.3	23	30	37	29	33	42	51	60	69	78	87	96	105	114
.4	31	40	50	38	44	56	68	80	92	104	116	128	140	152
.45	35	46	56	43	49	63	76	90	103	117	130	144	157	171
.5	39	51	62	48	55	70	85	100	115	130	145	160	175	190
.55	43	56	69	52	61	77	93	110	126	143	159	176	192	209
.6	47	61	75	57	67	84	102	120	138	156	174	192	210	228
.65	51	66	81	61	70	91	110	130	149	169	188	208	227	247
.7	55	71	87	66	77	98	119	140	161	182	203	224	245	266
.75	58	76	94	72	82	105	127	150	172	195	217	240	263	283
.8	62	81	100	76	88	112	136	160	184	208	232	256	280	304
.85	67	86	106	81	93	119	144	170	195	221	246	272	297	321
.9	70	91	112	86	99	126	153	180	207	234	261	288	315	342
.95	74	96	118	91	104	133	161	190	218	247	275	304	333	361
1.	78	102	125	95	110	140	170	200	230	260	290	320	350	380
1.1	86	112	137	104	121	154	187	220	253	286	319	352	385	418
1.2	94	122	150	114	132	168	204	240	276	312	348	384	420	456
1.3	101	132	162	123	143	182	221	260	299	338	377	416	455	494
1.4	109	142	175	133	154	196	238	280	322	364	406	448	490	532
1.5	117	152	187	142	165	210	255	300	345	390	435	480	525	570
1.6	123	162	200	152	176	224	272	320	368	416	464	512	560	608
1.7	132	172	212	161	187	238	289	340	391	442	493	544	595	646
1.8	140	182	224	171	198	252	306	360	414	468	522	576	631	684
1.9	148	192	237	180	209	266	323	380	437	494	551	608	665	722
2.	156	202	250	190	220	280	340	400	460	520	580	640	700	760

TABLE 17.

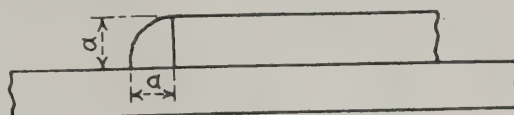
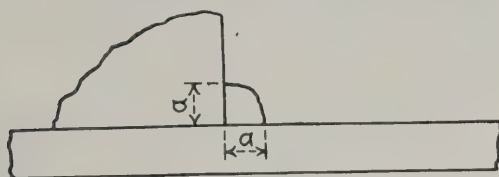
Actual minutes required to weld one foot of seam. This time includes all items except moving. (See Table 13.)



Average width (a) of seam in inches.	Thickness of Stock in Inches													
	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/4
.1	2	4	5	4	5	5	6	8	9	10	12	13	15	16
.2	5	7	9	8	9	10	12	15	18	21	24	27	30	33
.3	7	10	14	11	13	16	18	22	27	31	36	40	45	49
.4	13	14	19	15	18	21	24	30	36	42	48	54	60	66
.5	12	18	23	19	22	26	30	37	45	52	60	67	75	82
.6	14	21	28	22	27	31	36	45	54	63	72	81	90	99
.7	16	25	33	26	31	37	42	52	63	73	84	94	105	115
.8	19	28	37	30	36	42	48	60	72	84	96	108	120	132
.9	21	32	42	34	40	47	54	67	81	94	108	121	135	148
1.	23	34	47	37	45	52	60	75	90	105	120	135	150	165
1.1	26	39	51	41	49	58	66	82	99	115	132	148	165	181
1.2	28	42	56	45	54	63	72	90	108	126	144	162	180	198
1.3	30	46	61	49	58	68	78	97	117	136	156	175	195	214
1.4	33	49	65	52	63	73	84	105	126	147	168	189	210	231
1.5	35	52	70	56	67	79	90	112	135	157	180	202	225	247
1.6	37	56	75	60	72	84	96	120	144	168	192	216	240	261
1.7	40	60	79	64	76	89	102	127	153	178	204	229	255	280
1.8	42	63	85	67	81	94	108	135	162	189	216	243	270	297
1.9	44	67	89	71	85	100	114	142	171	199	228	256	285	313
2.	47	70	94	75	90	105	120	150	180	210	240	270	300	330
2.1	49	74	98	79	94	110	126	157	189	220	252	283	315	346
2.2	51	77	103	82	99	115	132	165	198	231	264	297	330	363
2.3	54	81	107	86	103	121	138	172	207	241	276	310	345	379
2.4	56	84	112	90	108	126	144	180	216	252	288	324	360	396
2.5	58	88	117	94	112	131	150	187	225	262	300	337	375	412
2.6	61	91	121	97	117	136	156	195	234	273	312	351	390	428
2.7	63	95	126	103	121	141	162	202	243	283	324	364	405	445
2.8	65	98	131	105	126	147	168	210	252	294	336	378	420	462
2.9	68	101	135	108	130	152	174	217	261	302	348	391	435	478
3.	70	105	140	112	135	157	180	225	270	312	360	405	450	495

For vertical and horizontal seams multiply by 1.2.
For overhead seams multiply by 2.

TABLE 18.—FILLET WELDING. Actual minutes required to weld one foot of seam



For seams up to and including $\frac{1}{4}$ inch time is for $\frac{1}{8}$ inch wire. Larger seams are estimated for $\frac{5}{32}$ inch wire

	Without Rest of Incidental Work				For Shop Work Includes All Items				For Shop Work Does Not Include Moving			
	Flat	Horiz.	Vertic.	Overh.	Flat	Horiz.	Vertic.	Overh.	Flat	Horiz.	Vertic.	Overh.
$\frac{1}{8}$	3.1	3.7	3.7	6.2	4	4.8	4.8	8	4.3	5.2	5.2	8.6
$\frac{3}{16}$	4.1	4.9	4.9	8.2	5.4	6.5	6.5	10.8	5.8	7	7	11.6
$\frac{1}{4}$	4.9	5.9	5.9	9.8	6.4	7.7	7.7	12.8	6.9	8.3	8.3	13.8
$\frac{5}{16}$	6.5	7.8	7.8	13	8.5	10.2	10.2	17	9.2	11	11	18.4
$\frac{3}{8}$	8.1	9.7	9.7	16.2	10.6	12.7	12.7	21.2	11.4	13.7	13.7	22.8
$\frac{7}{16}$	10.1	12.1	12.1	20.2	13.2	15.8	15.8	26.4	14.2	17	17	28.4
$\frac{1}{2}$	12.7	15.2	15.2	25.4	16.5	19.8	19.8	33	17.8	21.4	21.4	35.6
$\frac{9}{16}$	16.2	19.4	19.4	32.4	21	25.2	25.2	42	22.7	27.2	27.2	45.4
$\frac{5}{8}$	21.2	25.4	25.4	42.4	27.6	33.2	33.2	55.2	29.6	35.5	35.5	59.2

TABLE 19.—FILLING ROUND, FLAT, BACKED HOLES. Actual minutes required per hole
This time includes all items except moving

Diameter of hole, in inches.	Depth of hole, in inches											For 1/2" wire
	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	
1/4	.2	.3	.3	.4	.5	.6	.7	.7	.8	.9	1	2.3
3/8	.4	.6	.8	1	1.1	1.4	1.6	1.7	1.9	2.1	2.3	4
1/2	.7	1	1.3	1.7	2	2.3	2.7	3	3.3	3.7	4	4.6
5/8	.8	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.8	4.2	4.6	6.6
3/4	1.1	1.7	2.2	2.8	3.3	3.9	4.4	5	5.5	6.1	6.6	9
7/8	1.5	2.3	3	3.7	4.5	5.2	6	6.7	7.5	8.2	9	11.5
1	2	2.8	3.6	4.9	5.6	6.7	7.8	8.8	9.9	10.6	11.5	15
1 1/8	2.5	3.7	5	6.2	7.5	8.7	10	11.2	12.5	13.7	15	18.4
1 1/4	3	4.6	6.1	7.6	9.2	10.7	12.2	13.8	15.3	16.7	18.4	22.2
1 3/8	3.8	5.6	7.4	9.3	11.1	13	14.8	16.7	18.6	20.5	22.2	26.5
1 1/2	4.4	6.6	8.8	11	13.2	15.4	17.7	19.8	22	24.2	26.5	31.1
1 5/8	5.1	7.8	10.4	12.9	15.5	18.1	20.7	23.3	25.9	28.5	31.1	36
1 3/4	6	9	12	15	18	21	24	27	30	33	36	41.4
1 7/8	6.9	10.4	13.8	17.2	20.7	24.1	27.6	31	34.5	38	41.4	47.1
2	7.9	11.8	15.7	19.6	23.5	27.5	31.4	35.3	39.3	43	47.1	

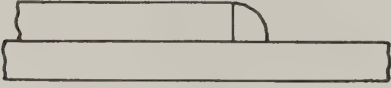
TABLE 20.—Actual minutes required per hole. This time includes all items except moving

Average width (a) of weld in inches	Depth of hole in inches										
	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$
$\frac{1}{4}$	.2	.3	.4	.5	.6	.7	.8	.9	1	1.1	1.2
$\frac{3}{8}$	.4	.7	.9	1.1	1.3	1.6	1.9	2.	2.3	2.5	2.7
$\frac{1}{2}$	.8	1.2	1.6	2.	2.4	2.8	3.2	3.7	4.	4.4	4.8
$\frac{5}{8}$	.9	1.4	1.9	2.3	2.8	3.2	3.7	4.1	4.6	5.	4.5
$\frac{3}{4}$	1.3	2.	2.6	3.3	4.	4.6	5.3	6.	6.6	7.3	7.9
$\frac{7}{8}$	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.	9.9	10.8
1	2.3	3.4	4.3	5.9	6.7	8.	9.4	10.6	11.9	12.8	13.7
$1\frac{1}{8}$	3	4.5	6	7.5	9	10.5	12.	13.5	15.	16.5	18.
$1\frac{1}{4}$	3.7	5.5	7.3	9.2	11	12.8	14.7	16.5	18.4	20.2	22.
$1\frac{3}{8}$	4.4	6.7	8.9	11.1	13.4	15.6	17.8	20.	22.3	24.5	26.7
$1\frac{1}{2}$	5.3	8.	10.6	13.2	16.	18.5	21.2	23.8	26.5	29.1	31.7
$1\frac{5}{8}$	6.2	9.3	12.4	15.5	18.6	21.8	24.9	28.	31.	34.2	37.4
$1\frac{3}{4}$	7.2	10.8	14.4	18.	21.6	25.2	28.8	32.4	36.	39.6	43.2
$1\frac{7}{8}$	8.3	12.4	16.6	20.7	24.8	29.	33.1	37.3	41.4	45.5	49.7
2	9.4	14.1	18.9	23.6	28.3	33.	37.7	42.4	47.1	51.8	56.6

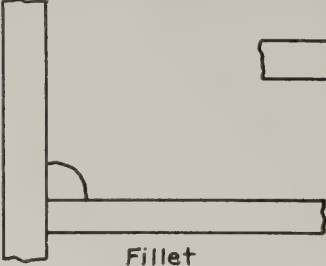
TABLE 21.—FILLING ROUND, OVERHEAD, BACKED HOLES. Actual minutes required per hole
This time includes all items except moving

Diameter of hole, in inches.	Depth of hole in inches											For ⅜" wire	For ½" wire
	¼	⅜	½	⅝	¾	⅞	1	1⅛	1¼	1⅝	1½		
¼	.3	.5	.6	.8	1	1.1	1.3	1.5	1.8	1.9	2	36.7	
⅜	.7	1.1	1.5	1.9	2.2	2.7	3.1	3.4	3.7	4.1	4.5		
½	1.3	2	2.7	3.3	4	4.7	5.3	6.1	6.6	7.3	8		
⅝	1.5	2.3	3.5	3.8	4.6	5.3	6.1	6.9	7.6	8.4	9.2		
¾	2.2	3.3	4.4	5.5	6.6	7.7	8.8	10	11	12.1	13.2	44.5	
⅞	3	4.5	6	7.5	9	10.5	12	13.5	15	16.5	18		
1	3.9	5.6	7.3	9.8	11.2	13.4	15.7	17.7	19.8	21.3	23		
1⅛	5	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30		
1¼	6.1	9.2	12.2	15.3	18.3	21.4	24.5	27.6	30.6	33.7	36.7	82.8	
1⅝	7.4	11.1	14.9	18.6	22.3	26	29.7	33.4	37.7	40.8	44.5		
1½	8.8	13.2	17.6	22	26.5	30.8	35.3	39.7	44.1	48.5	53		
1⅞	10.3	15.6	20.8	25.8	31	36.3	41.5	46.6	51.8	57.1	62.3		
1¾	12	18	24	30	36	42	48	54	60	66	72	94.3	
1⅞	13.8	20.7	27.7	34.5	41	48.3	55.2	62	69	75.9	82.8		
2	15.7	23.6	31.4	39.3	47.1	55	62.8	71	79.5	86.4	94.3		

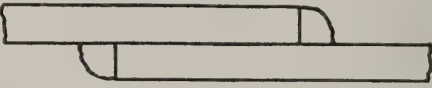
TABLE 22.—Cost of Welding Single and Double Lap or Fillet Joints Electrically, when done by average fast man at 82c per hour; current at 3c per kwh. and welding wire at 8.2c per pound. No overhead costs are included in this table



Single Lap



Fillet



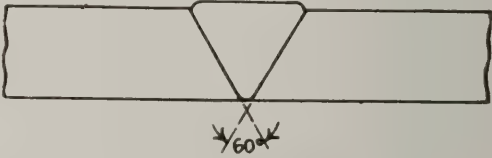
Double Lap

Thickness of Plate	Feet Per Hour	Kw. Hrs. Per Foot	Lbs. of Wire Per Foot	Cost of Labor in Cents	Cost of Current in Cents	Cost of Wire in Cents	Total Cents Single	Cost in Per Ft. Double
1/16	22	.08	.07	3.72	.24	.57	4.53	9.06
1/8	15.4	.12	.1	5.33	.36	.82	6.51	13.02
3/16	11.8	.18	.13	6.95	.54	1.06	8.55	17.10
1/4	9.5	.24	.16	8.64	.72	1.31	10.67	21.34
5/16	7.	.36	.20	11.7	1.08	1.64	14.42	28.84
3/8	5.7	.46	.25	14.4	1.38	2.05	17.83	35.76
1/2	3.6	.8	.45	22.8	2.4	3.69	28.89	57.78
5/8	2.2	1.5	.75	37.2	4.5	6.15	47.85	95.70

For vertical seams multiply by 1.2.
For overhead seams multiply by 2.

TABLE 23.

Cost of Welding Single "V" butt seams, electrically, when done by average fast man at 82c per hour; current at 3c per kwh. and welding wire at 8.2c per pound. Flat work and backed. No overhead costs are included.



"S" Stock	Feet Per Hr.	Mins. Per Ft.	Kw. Hrs. Per Ft.	Lbs. Wire Per Ft.	Cost of Labor Per Ft.	Cost of Current Per Ft.	Cost of Wire Per Ft.	Total Cost Per Foot		
								Flat	Vertical	Overhead
1/8	7.5	8	1.6	.3	\$0.11	\$0.05	\$0.03	\$0.19	\$0.23	\$0.38
3/16	5	12	2.1	.4	.16	.07	.04	.27	.33	.54
1/4	3.5	17	3.4	.6	.23	.10	.05	.38	.46	.76
3/8	3.1	19	1.3	.64	.26	.04	.06	.36	.44	.72
1/2	2	30	2	1	.41	.06	.09	.56	.67	1.12
5/8	1.5	41	2.7	1.5	.56	.08	.12	.76	.92	1.52
3/4	1.1	56	3.7	1.9	.77	.11	.16	1.04	1.25	2.08
7/8	.92	71	4.7	2.4	.97	.14	.20	1.31	1.57	2.62
1	.63	94	6.3	3.2	1.29	.19	.27	1.75	2.10	3.50
1 1/8	.5	120	8	4	1.64	.24	.33	2.21	2.66	4.42
1 1/4	.44	134	8.9	4.5	1.83	.27	.37	2.47	2.97	4.94
1 3/8	.37	161	10.7	5.4	2.20	.32	.45	2.97	3.57	5.94
1 1/2	.32	184	12.2	6.2	2.57	.37	.51	3.45	4.14	6.90

TABLE 24.—Cost, per hole, for filling flat round holes, under good working conditions. Labor 82c per hour. Wire 8.2c per pound and current at 3c per kilowatt hour. No overhead costs are included. No moving is included in these figures

Diameter	Depth	Mins.	Current in Kw. Hrs.	Lbs. Wire Used	Cost of Labor	Cost of Current	Cost of Wire	Total Cost	Cost Per Scattered Hole Aboard. All Items Included
3/8	1/8	.3	.06	.014	\$0.004	\$0.002	\$0.002	\$0.008	\$0.016
3/8	1/4	.4	.08	.028	.006	.003	.002	.011	.022
3/8	3/8	.6	.12	.042	.008	.004	.004	.016	.032
1/2	1/4	.7	.14	.04	.01	.004	.004	.018	.036
1/2	3/8	1	.2	.06	.014	.006	.006	.026	.052
1/2	1/2	1.3	.26	.08	.018	.008	.006	.032	.064
5/8	3/8	1.2	.24	.09	.017	.008	.008	.033	.066
5/8	1/2	1.6	.32	.114	.022	.01	.01	.042	.084
5/8	5/8	1.9	.38	.14	.026	.011	.012	.049	.098
3/4	1/2	2.2	.44	.16	.03	.013	.014	.057	.114
3/4	5/8	2.8	.56	.2	.038	.017	.016	.063	.126
3/4	3/4	3.3	.66	.24	.045	.02	.02	.085	.17
7/8	5/8	3.7	.74	.11	.05	.022	.024	.096	.192
7/8	3/4	4.5	.9	.25	.061	.027	.03	.118	.236
7/8	7/8	5.2	1.04	.42	.071	.031	.034	.136	.272
1	3/4	5.6	1.12	.44	.076	.034	.034	.144	.288
1	7/8	6.7	1.34	.54	.091	.04	.04	.171	.342
1	1	7.8	1.56	.64	.11	.047	.044	.201	.402
1 1/8	7/8	8.7	1.74	.61	.12	.11	.05	.28	.56
1 1/8	1	10.	2	.70	.14	.12	.057	.317	.63
1 1/8	1 1/8	11.2	2.24	.74	.15	.134	.061	.345	.69
1 1/4	1	12.2	2.44	.91	.17	.146	.075	.391	.78
1 1/4	1 1/8	13.8	2.76	.96	.19	.165	.079	.434	.87
1 1/4	1 1/4	15.3	3.06	1.03	.21	.184	.085	.479	.96
1 1/2	1 1/8	19.8	3.96	1.4	.27	.238	.115	.623	1.25
1 1/2	1 1/4	22	4.4	1.5	.30	.264	.123	.687	1.37
1 1/2	1 1/2	26.5	5.3	1.7	.36	.318	.14	.818	1.63

(To be continued)

Protective Coverings for Shipbuilding Purposes: Paints

By Horace Holden Thayer*

Continuation from the October issue of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

SHELLAC as previously stated is gum shellac dissolved in alcohol. Navy Department specifications for clear shellac call for 6 pints 1 gill of grain alcohol and 2 pounds 6 ounces of orange gum shellac per gallon. Colors are obtained by the addition of dry pigments. For furniture the shellac is grade A, and for other work, grade B. Their specifications for the orange gum shellac embody the following requirements:

GRADE A QUALITY

1. For pattern and varnish work.—To be of a grade similar in quality to the brand known commercially as "Double Triangle G," and must be friable by hand without the use of any tools. When treated with hot 95 percent alcohol, the residue of insoluble matter must not exceed 1¾ percent, and the shellac must be free from resin and other adulterants. All deliveries must be equal in color and in all other essential respects to the standard sample of this grade of shellac.

GRADE B QUALITY

2. For coating linoleum-covered decks.—To be of good quality and must be friable by hand without the use of any tools. When treated with 95 percent hot alcohol, the residue of insoluble matter must not exceed 3 percent. It must be of one of the following two qualities: (1) Free from rosin and have an iodine number of less than 18 as determined by method of subcommittee on shellac analysis (Journal of the American Chemical Society, pages 1221 and 1227, Volume XXIX, No. 8, August, 1907); or (2), the grade known commercially as "U. S. S. A. Standard TN," containing not more than 3 percent rosin. The grade of shellac known as "New York Standard 3 percent" will not be accepted. Deliveries of resin-free shellac and "U. S. S. A. Standard TN" must in all essential respects be equal to their respective standard samples of these grades.

GRADE C QUALITY—GARNETLAC

3. Garnetlac for coating linoleum-covered decks.—To be of good quality and ground fine enough to be readily soluble in alcohol. When treated with 95 percent hot alcohol, the residue of insoluble matter must not exceed 1 percent. To be free from resin and have an iodine number of less than 18, as determined by method of subcommittee on shellac analysis, referred to above. All deliveries must be equal in all essential respects to the standard sample of this grade of shellac.

BRIGHT FINISH WORK

A good standard of requirements for bright finish work in first class accommodations and similar spaces is as follows. The shellac is required to keep the stain or filler from coming through the varnish.

POPLAR

- 1 coat linseed oil 25 percent, turpentine 75 percent
- 1 coat oil stain containing 50 percent turpentine
- 1 coat shellac
- 2 coats interior varnish

OTHER WOODS

- 1 coat paste filler slightly darker than the natural wood
- 1 coat shellac
- 2 or 3 coats interior varnish

HARDWOOD FLOORS

- 1 coat paste filler
- 1 coat shellac
- 2 coats prepared floor wax

SPREADING POWER

A knowledge of the spreading power of paint, varnish, etc., is of considerable value in determining the kind to use as well as in determining the amount necessary. Some high priced products are found to be cheaper than those of lower price when the comparative spreading power is taken into account.

Dr. A. H. Sabin, whose work has been referred to in the section of this article dealing with priming paints, figures that a pure red lead paint, mixed in the proportion of 28 pounds of dry red-lead to 1 gallon of pure linseed oil, without turpentine or other thinner, when applied to average new structural steel surfaces will cover from 500 to 700 square feet per gallon for the first coat, from 650 to 800 square feet for the second coat, and from 700 to 850 square feet for the third coat. Thus for a combined priming and second coat, 1 gallon of paint will cover from 300 to 400 square feet, and for three coats 1 gallon will be required for every 215 to 245 square feet. Paint made up with paste red lead is considered to have a greater spreading power than similar paint made from dry red lead.

When figuring for estimating purposes more conservative amounts are usually used. These for one coat will be around 200 square feet per gallon for bottom compositions and 300 square feet per gallon for all other paints, including the priming paint.

Approximate figures given by the Navy Department for the spreading rates of their paints are of value and those of greatest interest in connection with this article are here given:

	Square Feet
Hand mixed red lead.....	450
Anticorrosive-Norfolk No. 17.....	270
Antifouling-Norfolk No. 19.....	243
Boottopping, red	405
Boottopping, light gray.....	684
Outside white	486
Outside black	477
Spar color	495
Inside white	432
Flat white	540
White enamel	540
Spar color for smokestacks	333
Light gray for smokestacks.....	477
White canvas preservative	70
Under cork	135
Clear shellac	450
Red or yellow shellac	369

PAINT SPRAYING

Of recent years the practice of applying such paints as priming paints and bottom compositions, and applying paints elsewhere where large surfaces are involved, with machines operated by compressed air, called paint guns, has become more and more prevalent. They are great labor and time savers as one machine will frequently do the work of five or more men.

Although the spraying machine manufacturers insist that it is not necessary to dilute the paints in order to apply them in this manner, this dilution is frequently practiced to the

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

extent of materially impairing the protecting value of the paint.

PAINT COLORS

Some colors are not lasting under shipboard conditions and others are undesirable in certain locations on account of soiling readily, the general effect produced, or for other reasons. Color schedules that have been tried out and found to give good satisfaction are therefore of value, and such a schedule is here presented. The bottom compositions and boottopping would be of the standard colors for the compositions used.

BLACK

Outside of hull from L. W. L. to rail, when the boottopping is dark.

Fire room ventilators, coaming and cowls.
Deck machinery and foundations.
Steering engine.
Bits, clocks, etc.
Anchors and hawse-pipes.
Stack.
Uptakes, etc.
Rigging fittings in way of black paint.
Deck fittings.

GRAY

Outside of hull from L. W. L. to rail, when the boottopping is gray.

Underside of decks in holds and 'tween decks.
Inside of poop, bridge and forecastle cargo and stores spaces.
Hold ventilators.

GREEN, LIGHT

Underside of deck over promenades.
Underside of deck over steering stations.
Underside of screens over windows.

LEAD COLOR

Canvas decks.
Hatch covers.
Cargo battens.

RED, BRIGHT

Inside of ventilator cowls.

RED, DARK

Topside of steel decks where painted.
Waterways.
Machinery foundations in engine rooms, etc.

RED, OXIDE

Sides of cargo holds and 'tween decks.
Inside of steel hatch coamings.
Outside of shaft tunnel.

SLATE COLOR

Boiler room.
Engine room dado to 3 feet above the working platform.
Shaft tunnel dado to 3 feet above the working platform.

SPAR COLOR

Outside of superstructure below grab rail.
Outside of hatch coamings.
Low skylights.
Masts.
Outside of hold and engine room ventilator coamings and cowls.
Propelling machinery and auxiliaries.
Ice machines.

WHITE

Outside of poop, bridge and forecastle above rail.
Outside of superstructure generally above grab rail.
Exposed woodwork generally except decks, machinery foundations and hatch covers.
Partitions in quarters, etc.
High skylights.
Companions.
Ice machine room.
Dynamo room.
Engine room above 3 feet high dado.
Inside of engine and boiler casings.
Engine room ventilators.
Inside of shaft tunnel above 3 feet high dado.
Ridge poles and spreaders.
Rails and stanchions.
Flag poles.
Boats and davits.
Life rafts.
Rigging fittings in way of white paint.
Small canvas covers for binnacles, rope reels, ventilator caps, etc., waterproofed.
Binnacles, if not natural or bright finish.
Ship's name.

The Navy Department has formulated a color scheme for piping which is of great value in enabling the ready determination of the service of the piping, and this system has been largely adopted in merchant practice. Their specifications for this are:

Standard Coloring for Piping.—All voice pipes shall be painted the shade and color of the surrounding surfaces. The body color of all pipes or pipe covering, exclusive of pneumatic piping, which shall be painted in its distinctive color throughout, shall conform in shade and color to that of the surrounding surfaces, except on edges and side of flanges, where the distinctive colors shown in the following sketch shall be painted. The edges of flanges of fuel oil filling pipes, down to the tank; when no manifold is fitted, shall be painted the same color as delivery pipes, *i. e.*, red. Where a pipe has no flanges, the couplings and elbows shall be painted as per standard at flanges. Where a pipe has neither flanges nor couplings, a circumferential band, or bands, containing the distinctive colors, shall be painted at suitable intervals. No compartment shall be left with pipes unmarked.

The sketch referred to shows the color around the flanges and the color of bands painted on the pipes about one inch away from the flanges. The following schedule gives the same data. The bands are 4 inches wide unless otherwise stated:

		Flanges	Bands
Steam piping	Supply	Black	White
	Exhaust	Red	White
Salt water piping	Suction	Black	Green
	Delivery	Red	Green
Fresh water piping	Suction	Black	Lead color
	Delivery	Red	Lead color
Hydraulic piping	Supply	Black	Blue
	Exhaust	Red	Blue
Ventilation piping	Supply	Black	Yellow
	Exhaust	Red	Yellow
Fuel oil piping	Suction	Black	Red (2"), white (2"), red (2")
	Delivery	Red	Red (2"), white (2"), red (2")
	Both services	1 Black, 1 red	Red (2"), white (2"), red (2")
Drains, scuppers, air pipes, sounding pipes		White	White
Fire main		Red	Red
Flooding pipes for magazines, peak tanks, etc.		White	White with red lengthwise stripe
Pneumatic piping		Black	Black (continuous)
Air-water ejecting system		Black	Red (2" next flange)
			Black (next 6")
Carbon dioxide fire extinguishing system		Black	White (2" next flange)
			Black (next 6")
Refrigerated water piping		Red	Lead color with 2 white squares
Hot water piping		Red	Lead color with white lengthwise stripe

CONSUMABLE STORES

Paints carried for the painting of topsides by the crew, and other work about the vessel, should be in conformity with those previously applied. A good selection of engineers' consumable stores for the general run of merchant ships is as follows:

	Quantity
Asphaltum, black	5 gallons
Brown, metallic, ground in oil	25 pounds

	Quantity
Graphite (amorphous) in 5-pound cans.....	10 pounds
Japan drier	2 gallons
Lamp black	2 pounds
Linseed oil, boiled and raw	20 gallons
Litharge, for ammonia joints or as drier.....	5 pounds
Prussian blue, for bearings and gears.....	1 pound
Red lead, dry, in 25-pound kegs.....	100 pounds
White lead, in oil, in 25-pound kegs.....	50 pounds
Turpentine	10 gallons

Insurance Companies Seek Settlement for War Losses

Claims Allowed by Washington Commission Against Germany Will Be Awarded to War Risk Insurance Companies Who Paid Losses on American Ships

By "Bordereaux"

THE most interesting, though not the most unexpected, occurrence in marine insurance during the past few weeks has been the denial by the Mixed Claims Commission, sitting at Washington, of the demand of Americans for the recovery from Germany of amounts paid by them for war risk insurance during and immediately after the World War. This outcome of an unjustifiable desire to get something for nothing out of the Teutons has repeatedly been predicted in this department of MARINE ENGINEERING AND SHIPPING AGE. The underwriters were not out anything, because they had accepted the hazard and been content with the extra remuneration received by them; nor were the ship-owners in position to pose as claimants, because they had long since passed the extra cost along to their consumers. Nevertheless, there was a great rush to try and get something out of Germany, the total running into hundreds of millions.

The Commission has still to rule upon the various claims for damage to or destruction of property of American nationals by Germany and her allies; and under this classification will come the claims for ships and goods lost by the sinking of ships by submarines, mines and otherwise. When claims are allowed for the loss of property by Americans, and the owners of such property have already been indemnified for their losses by war risk insurance companies, the latter will figure as assignees of such claims under the subrogation they took when they paid the claims, and it is the expectation of the underwriters that in such cases the claims will be paid to them under such subrogation agreements.

In passing adversely upon the claims for refund of war risk premiums, the Commission stated its conclusions as follows: "It is evident that during the period of neutrality both groups of belligerents freely resorted to 'retaliatory measures,' to the detriment of all neutral commerce, over the vigorous and repeated protests of the Government of the United States; and in both theory and practice, as demonstrated by actual experience, the American nationals insured against the risks created by the acts of both groups, risks inevitably incident to the very existence of a state of war. Obviously it is impossible, therefore, to attribute these risks to the acts of Germany without holding her liable for all the consequences of the war, which, under the treaty, is not permissible. In this group of claims there is no complaint of injury to or destruction or seizure of property by the act of Germany or her agents. The sole complaint is that the hazards of war required the claimants as a matter of business prudence to protect by insurance against risks which never matured into damage to or destruction of the property insured, and the claimants seek to recover from Germany the cost to them of such insurance."

Hull Insurance Unsatisfactory

STUDENTS of marine insurance in Great Britain have been making approximate surveys of the progress of hull underwriting in 1923 and they are unanimous in declaring that rates are too low, conditions too liberal, and that there is urgent need of a closer agreement among underwriters for their own protection. Throughout the year the decline in both hull and cargo rates has been steady, even to the point of absurdity; and that in the face of a more than normally heavy loss experience. There is the slimmest chance of underwriting profit this year.

A dependable authority states that losses of British steamers which in tonnage were greater in 1922 than in 1921, are above the 1921 total, and are likely to exceed the 1922 total with average losses to the end of the year. American steamer losses, which in 1922 were below those of 1921, reached the 1921 total before the end of October. Taking underwriting figures on steamers for time on Institute clauses, *Fairplay* insists that it will be found that the 1922 account is running off with a considerably greater loss than the 1921 account at the same period, and that there is every probability of 1923 going badly also. The fact that, owing to the low freight rates obtainable, only the better class of boats has been employed is, naturally, in favor of the underwriters. Experience during the present year has led underwriters to discount the familiar contention that the marine hazard has been reduced because of the various improvements in navigation.

Repair costs are not coming down. An American underwriter informed a friend recently that on one of his risks the repair of a crankshaft involved a cost equal to one-half the insured value of the steamer. In Great Britain the hull business is the important end of the market to the underwriter. In the United States it is the reverse, as Americans have never been keen over hull lines.

London has gone after American hull business in the most deadly earnest, quoting rates that made competition on this side impossible. Secure in the holding of their English business they have been offered quotations for American vessels at substantially lower figures than they accorded their own nationals. Then, when they had corralled everything in sight over here, they got together, last September, and decided to abandon cut-rate methods and stand out for the maintenance of rates and conditions at a fair figure. In this apparently desirable action they invited the defeated American underwriters to join in locking the barn after the horse had been stolen. If London is now discovering that an underwriting loss lies ahead of them it does not come to

the American underwriters as a surprise. The famed British "world spread" will have to help London out of its hole.

On-Deck Stowage

FALL and early winter storms on the Atlantic have been bringing their usual quota of losses and considerably more this year. Under such circumstances it has been only natural that cargo stowed on deck should have suffered in proportion, and underwriters have been watching this class of business with keen eyes. It is one of the fundamental principles of marine insurance that cargo shall be stowed in accordance with the recognized rules of shipping and in most cases this means below deck. The responsibility for violation of this rule may involve the shipowner and operator and it is essential that these interests be acquainted with the rules and regulations of the trade. In issuing the usual form of basic cargo policy, where no mention is made of the place of stowage of the cargo, the underwriter is protected against the possibility of loading on deck cargo which is customarily loaded under deck.

If a vessel owner gives a clean receipt for ordinary cargo the cargo must be stowed under deck and if it is loaded on deck the vessel owner does so at his own risk. In such an instance the basic form of marine policy would not attach on goods, as the merchandise was not stowed in the customary place for the carriage of such cargo. Should damage to the cargo eventuate, the owners would be compelled to look to the vessel owner for reimbursement. Acids and other highly dangerous commodities are, in many instances, required by law to be carried on deck. Therefore, even though the assured neglects to state that such goods are actually laden on deck, the underwriter would be liable, if so laden, without notice.

Lumber is frequently insured on deck, subject to regular f.p.a. conditions, but it is difficult to insure acid except free of claim for damage but including loss by washing overboard or jettison. The ordinary on-deck rate varies from two to five times the under-deck, depending upon the type of cargo and the length of the voyage.

Under the York-Antwerp rules, on-deck cargo contributes in general average, but is not contributed for. It is easy to understand the reason for this rule if one considers that jettison of cargo for the benefit of all interests is customarily made good as a general average sacrifice, and on-deck cargo would, in almost all cases of stress, be thrown overboard immediately as a precautionary measure, thus subjecting the under-deck cargo to a charge which is due more to the manner of the stowage than to its being a sacrificial measure. On the other hand there is no reason why on-deck cargo should not contribute in general average if expenses or losses are incurred from which the on-deck cargo benefits. The ordinary on-deck insurance includes coverage against general average and salvage charges.

The danger of on-deck cargo breaking adrift, and its susceptibility to loss or damage because of its exposed position, makes it necessary that strict rules be made for the proper stowage of such cargo. And that is why we find that underwriting boards lay down specific methods for loading and securing deck-laden goods.

Deviation Permit

THE following clause is now being used by the United States Shipping Board in its bills of lading:

"If vessel be prevented from reaching her destination by quarantine, shallow water, blockade, conditions of weather, surf, ice, war or civil disturbances; or, if it becomes impracticable to discharge the goods at destination on account of congestion, strike, labor difficulties, or otherwise, occurring before or after receipt of goods by the carrier, ves-

sel shall have liberty, without proceeding to or near port of destination, to proceed to and discharge the goods at a nearby available strike free, uncongested port. Notice of discharge of the goods shall be dispatched to consignee, if named herein, otherwise to the shipper, and such discharge shall be deemed a complete delivery under this contract and full freight shall be deemed earned. All expenses incurred on the goods shall be a lien thereon."

This is all very nice, but there is an insurance angle to it that ought not be overlooked. The ordinary marine policy contains a clause excluding the risk of strike and riot, and the insurance might well be invalidated by the operation of the clause above given, which grants the privilege to the carrier in event of congestion at one port to discharge at a nearby port. Despite the deviation clause of the marine policy, if the deviation is caused by some such reason as a strike, which is expressly excluded from the policy, the underwriters in all probability would not be liable during the period of deviation.

Coffee Cargo Swelled

THE Pacific Mail steamer *Cuba* which went ashore in the Pacific off San Miguel Island a month or two ago was finally abandoned with a loss of \$400,000. A peculiar thing about this casualty is that the cargo of coffee swelled greatly through action of the water. Underwriters have had frequent experience of damage to vessels due to the swelling of grain cargo but it is rare indeed for such damage to be caused by the swelling of coffee. Three or four years ago a case was reported where the seams of a wooden schooner bound from Brazil to New York were opened by this cause, but that was the first case of the kind of which there was any knowledge. It is now claimed that the destruction of the *Cuba* was not owing so much to the pounding of the waves as to the swelling of the cargo of coffee which caused the hull and decks to be forced out of line.

Pilferage Bureau Popular

MARINE insurance men at New York have faith in the success of the proposed Pilferage Information Bureau, provided that all who now profess interest in its organization will adequately support it after it has been started. They believe it will aid materially in controlling and reducing theft and pilferage losses at this port. The underwriters have been represented at the meetings of the provisional committee and one of them, H. H. Reed, is a member of that committee which, as is known, has been invited to continue its work and draft by-laws and nominate officers in order that the Bureau may become a concrete fact and begin to function at the earliest possible moment. Through such a clearing house, insurance and shipping interests, it is believed, could secure the maximum amount of information for the tracing and punishment of cargo thieves. It is not planned to employ either watchmen or detectives, but merely clerks who shall assemble and classify the information turned in by Bureau members or from any other source. Every report of a theft is to be forwarded immediately to each member and thus solidify a strong and organized support behind the movement.

Report on Talin (Reval)

A DIGEST of information on the port of Reval has been prepared by the Board of Underwriters of New York, in which the following interesting data appear: Vessels drawing thirty feet can pass in and out. No tide. The total length of the berthing space is about 7,800 lineal feet, the depth along the quays being from 18 to 30 feet. All quays are provided with normal gage railway, and two quays are provided with a narrow gage railway in addition. Cargo

U. S. S. West Virginia Goes Into Commission This Month

**Last of the Electrically Driven Battleships Completed at Newport News
—Propelling Machinery Supplied by the General Electric Company**

THE *West Virginia*, last of the battleships to be built by the United States Government under the Washington Arms Conference limitation and sixth to be equipped with electric drive, will leave the yards of the Newport News Shipbuilding and Dry Dock Company about December 1 to go into service under the command of Cap-

The vessel is 624 feet long, 97 feet beam at the waterline, and displaces 32,600 tons. She is expected to make 21 knots and has a cruising radius of about 10,000 miles. She will burn oil, her fuel capacity being about 1,400,000 gallons.

ELECTRICAL MACHINERY

The *West Virginia* is electrical throughout. Her main propulsion machinery consists of two Curtis steam turbine-generators, designed to develop 12,600 kilowatts at 2,150 revolutions per minute. These supply power to four 8,000 horsepower General Electric induction motors, directly connected with the four propellers and turning at 177 revolutions per minute. The motors are 12 feet in diameter and weigh 62 tons.



U. S. S. West Virginia, the Last of the American Battleships to Be Commissioned

tain Thomas J. Senn. She will be a sister ship to the *Maryland* and the *Colorado*.

Carrying eight 16-inch guns, the *West Virginia* will be the most powerful fighting craft in the world. She will have a secondary battery of fourteen 5-inch guns, four 3-inch anti-aircraft guns and two underwater 21-inch torpedo tubes.

The two turbine generators, supplied with steam generated by eight oil-burning boilers, can be run independently. Either is capable of driving the ship up to a speed of about 17 knots. The power generated by them is used for no other purpose than propulsion, electrical current for other needs being generated by six 300-kilowatt generators and two 400-kilowatt Diesel generators.

can be loaded or discharged directly from the vessel into railway trucks, or vice versa. For lifting heavy cargo five floating steam cranes are available.

Failure of Condenser Tubes

(Continued from page 773)

be quite confidently stated that no facts whatever supported by any records of experience exist by which the observable or measurable properties of a condenser tube beyond those incident to good workmanship can be predictably related to its service endurance. The effect of such specifications, therefore, can only be to increase the ultimate cost of condensations. The American Society for Testing Materials has adopted specifications which it is believed comprehensively cover all the requirements of the best manufacturing

practice and their unanimous acceptance by both producers and consumers alike could have no other result than to bestow on the industry all of the benefits incident to the introduction of standards into a situation in which they have had no previous existence.

In conclusion the writer wishes to point out the desirability of and necessity for a thorough investigation of condensers and the conditions under which they are operated as a means of providing data looking to the solution of the problem of tube failure. If in the presence of adequate records of temperatures, water velocities, shut downs, cleaning procedure, etc., failed tubes are withdrawn as they give out and the character of corrosive action involved in each case determined, much more progress will be made than through any amount of speculation based upon the physical and other properties of the tubes themselves.

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Figuring Indicated Horsepower of Compound Engine

Q. (1,218).—Referring to Q. (1,198) in the June issue: "How to calculate Indicated Horsepower when Mean Pressure of Cylinders Are Unknown" refers to a three-cylinder triple-expansion engine. Could the same quantities be used for calculating the indicated horsepower of a two-cylinder compound engine except for the value of E? or—How could the indicated horsepower of a two-cylinder compound engine be found without knowing the mean effective pressures in the cylinders?

Diameter high pressure cylinder $17\frac{3}{4}$ inches or 18 inches;
Diameter low pressure cylinder 38 inches;
Stroke, 28 inches;
Revolutions per minute, 90;
Steam pressure, 175 pounds per square inch; vacuum, 24 inches.

A. (1,218).—Use the same nomenclature as in the answer to Q. (1,198) in the June issue.

$C_h = 60$ percent. This value has been assumed and varies from 50 to 70 percent for this type of engine.

$A_h = 247.5$ square inches.

$A_1 = 1,134$ square inches.

$$R = \frac{A_1}{C_h \times A_h} = \frac{1,134}{.60 \times 247.5} = 7.638$$

Hyp. log R = 2.0331.

P = 175 pounds absolute. This allows for 15 pounds drop between the boiler and engine steam chest.

L = 2.33 feet.

R.P.M. = 90.

S = 419.4.

p = 5 pounds. This value should be about 2 pounds higher than that corresponding to vacuum. It would have been better in my answer to question (1,198) to have used 4 pounds instead of 3.

$$P_m = P \times \frac{1 + \text{hyp. log } R}{R} - p = 175 \times \frac{1 + 2.0331}{7.638} - 5 = 64.5$$

E = .60 to .67 for this type of engine. Use .635.

$P_r = P_m \times E = 64.5 \times .635 = 41.$

$$\text{I.H.P.} = \frac{P_r \times S \times A_1}{33,000} = \frac{41 \times 419.4 \times 1,134}{33,000} = 591.$$

Fit of Propeller on Shaft

Q. (1,226).—Should a propeller be set up hard on the shaft taper or made an easy fit (secured with key and nut) for convenience in removal?
MACHINIST.

A. (1,226).—A propeller should be set up hard on the shaft taper, either by driving on or by the use of a sledging wrench, depending upon the size of the job, to guard against danger of backing off and to relieve the load on the propeller key. A propeller becoming loose on its shaft, even though the nut was locked, would soon batter the key to

pieces. In naval practice, contractors are required to furnish propeller sledging wrenches.

Propellers as a rule are drilled and tapped for strong-back bolts for use in pulling them off.

Strength of Boiler Water Gage Glass

Q. (1,227).—Why doesn't the water gage glass on a boiler burst from the pressure of the steam?
J. W. D.

A. (1,227).—The stress per square inch on a gage glass due to the pressure alone is low, as will be seen from the following:

Inside diameter of glass	$\frac{1}{2}$ inch
Thickness of glass	$\frac{7}{64}$ inch
Boiler pressure, pounds per square inch gage.....	200
	$\frac{200 \times .5}{.1094 \times 2} = 457$

Assuming a tensile strength of 3,500 pounds per square inch gives a factor of safety of 7.66. This is a larger factor than the 4 to 4.5 usually allowed for Scotch boiler construction. It will therefore be seen that the glass from a boiler pressure standpoint is stronger than the boiler. There are, however, other factors entering into the manufacture of gage glasses which must not be neglected such as resistance against sudden temperature changes due to cold air coming in contact with the hot glass; and corrosion of glass due to steam, feed water and boiler compounds. Strains are often set up in the glasses, which can not be taken care of by calculations, due to misalignments of glass and fittings when assembling.

Influence of Ash in Coal on Boiler Efficiency

Q. (1,225).—What is the influence of the percentage of ashes in coal on the boiler efficiency?
O. K.

A. (1,225).—There are two methods of figuring boiler efficiency:

1. Efficiency of the boiler =
Heat absorbed by boiler per pound of combustible

Calorific value of one pound of combustible

2. Efficiency of boiler, furnace and grate =

Heat absorbed by boiler per pound of coal

Calorific value of one pound of coal

The first is based upon the combustible content of the coal and is preferable as a standard of comparison for all tests as well as being the one usually understood when boiler efficiency is referred to. The second is based upon dry coal and permits of comparison of the combined boiler, furnace and grate performance.

Ash consists of the non-combustible residue left after complete combustion has taken place. It not only is waste material in the coal but it carries away with it a considerable amount of unburned carbon when cleaning fires. The amount of ash in a coal is extremely important to know because of the effect of its fusibility upon the steaming quality of the

coal. As the ashes fuse, clinkers are formed on the grate which together with the unfused ashes clog the grate, cutting off the air supply to the fire thus necessitating frequent cleaning and retarding combustion to such an extent that the boiler efficiency becomes rapidly impaired.

It may be seen from the foregoing that while the calorific value of coal is decreased by the presence of ash and though the heat absorbed by the boiler per pound of coal is theoretically decreased probably in the same proportion, yet in reality as the percentage of ash is increased, its heating value decreases in more rapid proportion thus lowering the boiler's combined efficiency.

LETTERS TO THE EDITOR

Weight of Engines in M. S. Crux

TO THE EDITOR:

COPENHAGEN, Denmark.

We have studied the article "Europe Developing New Types of Diesel Engines" in your October issue with much interest, and note the statement that the less weight of the machinery of M. S. *Crux* is only achieved by adopting "the high speed of 145 to 150 revolutions per minute."

We cannot admit you are right and only draw your attention to the fact that the same number of revolutions was used in several of our older motorships as M. S. *Suecia*, M. S. *Pedro Christophersen*, M. S. *Arator*, etc., where the weight of the machinery was considerably greater than for the M. S. *Crux*.

According to our experience this number of revolutions has always proved suitable in the ships where it has been used.

AKTIESELSKABET
BURMEISTER & WAINS,
MASKIN-OG SKIBSBYGGERI.

Cooperation Between Owner, Builder and Operating Personnel

NEW YORK, N. Y.

TO THE EDITOR:

At the present time we hear much about the high cost of operating American ships, and the importance of saving "here and there." Much is expected of the marine officer in the accomplishment of this desired end. As a general rule, the officer does all he can and is fully alive to this important matter. He is only too anxious to cooperate with the owner, as it means his very bread and butter in plain words.

If the owner claims a handicap, and no doubt he does, when comparing with certain European standards, the ship's officers are also put under a handicap by their unskilled and ever-changing crews. They have continuously to teach green crews and very seldom realize a fair return on their investment as the men generally don't stay long enough on a ship to master the profession thoroughly or to be of any material help and assistance. Men nowadays don't seem to realize the importance of learning a trade thoroughly nor to have the patience to do so. It is a rarity to find a mechanic of any trade among the crew or even among the engineers. Again the relations of the ship's personnel and officers are not always of the best; in some cases amounting to open hostility. Often a senior officer is blamed for every little mistake made by those under his charge, and long years of service and loyalty are rewarded by a dismissal after spending the best part of his life in a firm's employ. A lot could be done, if officers and their employers could get better acquainted and meet each other halfway. Loyalty begets loyalty and it is the human factor, after all, that decides profit and loss in any line of business.

Secondly, there is a great field for improvement in designing and installing the various auxiliaries of the ship's power plant, whereby the cost of upkeep would be materially lessened and at sea made easier. If auxiliaries were only installed in accessible places, it would not be necessary, as is too often the case, to dismantle about half the engine room in order to remake some pipe joint. It is only a matter of using the allotted space to the best advantage instead of shoving everything in one corner and wasting the other. A good many ships have a fairly complete machine shop to take care of routine work, but often in such a place that it is almost impossible for a man to work there on account of abnormal heat and poor ventilation, so really, considering the cost of installation, it becomes a liability instead of an asset.

There is a great field for improvement in the merchant marine—above all in closer cooperation and good will between owner, builder and operating personnel to the mutual benefit of all concerned.

New York.

MARINE ENGINEER.

NEW BOOKS

The Lookoutman

Reviewed by Carl E. Petersen
Naval Architect, United States Lines

THE LOOKOUTMAN. By Captain David W. Bone. Size, 8¾ by 6 inches. Pages 220. Illustrations, 22. New York, 1923: Harcourt, Brace & Company.

To those who "go down to the sea in ships" or who are otherwise engaged in the design, building or operating of ships, the latest book, "The Lookoutman," by Captain David W. Bone, master of the Cunard liner *Tuscania* will instantly appeal. While the book is primarily intended to familiarize the layman with the general types comprising the present day tonnage it is so full of information concerning these types, their functions and their behavior at sea that no technical man who loves his profession should miss an opportunity to read it.

The book consists of fourteen chapters: 1, "Getting Under Way"; 2, "The Great Ships"; 3, "Mail Liners"; 4, "Intermediate and Cargo Liners"; 5, "Tramp Steamers"; 6, "Turret Ships and Oil Tankers"; 7, "Steam Yachts and Cross-Channel Express Steamers"; 8, "Coasters and Short-Sea Traders"; 9, "Fishing Craft"; 10, "Pleasure Steamers"; 11, "Dredgers and Attendant Craft"; 12, "Tugs and Port-Service Vessels"; 13, "Piping Down," and "Glossary of Sea Terms." The book is well illustrated with sketches and small scale silhouette profiles. There is also appended a splendid glossary of sea terms for the uninitiated.

Perhaps no other recent author has explained the sentient bond existing between man and ship as has Captain Bone in his introduction, which reads as follows:

"The attitude of the sailor toward the ship is sufficiently peculiar to call for comment. To him, a seaworthy vessel is quite unlike any other structure fashioned by man. He sees her as a sentient creature with a decided personality; a spirited rover of wide seas, possessing qualities no less resourceful and adventurous than his own; a creature to be humored and admired (or perhaps forced and cursed) as her tricks and moods and tempers become revealed to him. For this belief, the circumstances of her birth are sufficient warrant. Conceived in the studious and creative mind of her designer, erected in patient exactitude by her builders, trimmed and riveted and fashioned into a complete and wonderful whole by the skill and craftsmanship of her artisans, she comes to her sea world with sponsors and guarantors enough. Surely, some intangible essence, some spirit of all these labors at her birth—the conceptive thought, skilled direction, the sweat and strain of toiling hammermen—must pass into her shapely hull as it grows upon the stocks. And when, at length, she is named and launched and floats upon the

river reach—a noble vessel, powerful, buoyant, inspired by the stir and circumstance of her baptism—the cheering shipyard workers must feel that a part of themselves goes out abroad with this wonderful product of their hands. It is this conception of personality and character in a ship that the sailor accepts. He may call her brute or lover, he may beat and drive her or handle her with tender care, but she is never a senseless machine to him. The reader is entreated to tolerate this simple faith."

In the second chapter listing the ten great liners or "Sea Queens" are included our own *Leviathan* and *George Washington*. The other vessels named, the *Majestic*, *Berengaria*, *Olympic*, *Homeric*, *Aquitania*, *Mauretania*, *Paris* and *Belgenland*, together with our own are chosen "not merely because of their great size, but rather by virtue of the completeness and safety of their performance."

A noteworthy statement which designers of vessels may well bear in mind is—"It is a fact, peculiar and perhaps unaccountable, that the most graceful ships are the most sea kindly in a gale."

Regarding the mail liners as apart from the leviathans of the ocean, Captain Bone has this to say: "As it seems unlikely that any new ships of the greater class will be laid down in the near future, the mail liners may be looked upon as the heirs apparent to the maritime thrones of the nations." The author makes the following remarks on the 535-footers:

"At a first glance, one is inclined to dismiss her as unworthy of sailorlike attention; she appears to be unnecessarily odd in her proportions; her peculiar features are aggressively at variance with all the accepted standards of a fine ship design. But such a view would be unfair to an excellent, if unorthodox, intermediate liner. She is distinctly a product of the war, and German submarines are to be blamed for her departures from the symmetry of conventional ship architecture. If she could be seen from the point of view of her designer, who was concerned to present a distorted outline to the periscopic survey of an enemy submarine commander, one would doubtless form a better and more kindly estimate of the skill with which this requirement, at least, has been met. She was originally built as one of a transport fleet for the carriage of United States troops, but these vessels were not completed when the war ended. When under construction, she was converted into a cargo carrier of large capacity with very fine accommodations for a comparatively limited number of passengers. One of her peculiar (war-time) features is the form of the stern, an ingenious copy of the bow structure of the ship, and one which, together with the upright setting of masts and funnels, made it very difficult for a distant observer to determine whether she was bound east or west. But for this arrangement (which one would hesitate to term seemly) her hull has fine lines and the great flare of the bows is particularly noticeable. Her passenger accommodation is in a box-like superstructure amidships and is perhaps more ample and convenient than that of vessels having more graceful and less rectangular deck erections. She has a speed of about fifteen knots (speed erroneously stated, should be 18 to 19 knots) and is altogether a strong and seaworthy vessel."

At the present time with very much depressed shipping conditions in this country, full significance should be taken of the author's statement:

"The laying down of the great emergency fleet, * * * * * was a new adventure for Uncle Sam. For years he had been lying on his oars, content to let other nations do his 'trucking.' In competition with the cheaper workmanship, cheaper materials, cheaper manning, of other maritime nations, he could see little or no profit in an adventure on the deep. Came the war, and the perspective of his vision altered rudely. The film of 'profit and loss' dissolved, showing the ships as one of the great material assets of a nation. The cry was for ships, for ships at any price! Much can be done when costs are in the clouds, when all considerations of profit are blown over the horizon before the blast of war. The tremendous augmentation of American tonnage that astonished the world and did so much to end the war came when Uncle Sam put aside his 'landward' toys and commenced to ply the oar again."

The "oil tanker" is considered by the author as being probably the nearest approach to the unsinkable ship that has yet been conceived by the naval architect, and in her he has designed a ship that combines great stability and power, excellent speed and ease of maneuver, with a capacity to carry a large burden.

Finally the book is highly informative and very interesting and the author is to be commended on the pleasing manner in which he has presented a broad and varied subject.

DIESEL AND OIL ENGINE HAND BOOK. By Julius Rosbloom. Size, 5½ by 7 inches. Pages, 376. Numerous illustrations. Los Angeles, Cal., 1923: The Technical Publishing Company.

This book is a compilation of a quantity of more or less disconnected data relative to Diesel and oil engines, together with some very short and elementary explanations of the principles of thermodynamics, indicator practice and electrical measurements. The main value of the book is embodied in a considerable amount of information, in the form of questions and answers, relative to the operation of internal combustion engines.

PERSONAL MENTION

H. H. BENEDICT, formerly traffic manager of the Green Star Steamship Corporation, is now New England agent of the Pacific Mail Steamship Company.

CHARLES MACGREGOR has left the Shipping Board staff at 45 Broadway, New York, and returned to his old connection with the Export Steamship Company.

W. S. WILKINSON, technical manager for some time past at the New York office of the Bethlehem Shipbuilding Corporation, has been transferred to the Moore plant at Elizabethport, N. J.

HERBERT N. THOMAS, formerly manager of China Mail Steamship Company, is now on the staff of the Robert Dollar Company, under Hugh McKenzie, head of the passenger department. Prior to joining the China Mail, Mr. Thomas was with the Pacific Mail Steamship Company.

F. B. WEBSTER, who recently resigned the position of editor of MARINE ENGINEERING AND SHIPPING AGE to become business manager of *The Marine Journal*, is a graduate of the Massachusetts Institute of Technology of the class of 1901 in naval architecture and marine engineering. Mr. Webster began his career as a ship fitter in the yard of the Fore River Ship and Engine Company, which is now a part of the Bethlehem Shipbuilding Corporation, Ltd. He worked in the drafting rooms of the Puget Sound Navy Yard, the Moran Company and the Seattle Dry Dock and Construction Company until early in 1914, when he went to the Bureau of Construction and Repair, Navy Department, Washington, D. C., to take a position in the research and scientific department. He resigned from this position in 1917 to become naval architect for the Liberty Shipbuilding Company and subsequently naval architect and chief designing engineer for the Concrete Ship Section of the Emergency Fleet Corporation. After the armistice Mr. Webster compiled the "Shipbuilding Cyclopedia" for the Simmons-Boardman Publishing Company, subsequently becoming editor of MARINE ENGINEERING AND SHIPPING AGE.



F. B. Webster



Frank J. Shipman, President, American Marine Association

Marine Association Elects Officers for the Coming Year

ON Saturday, November 10, the annual meeting of the American Marine Association was held in the Waldorf-Astoria Hotel, New York City. Frank J. Shipman, of the Texas Company, was elected president for the coming year, succeeding Colonel E. A. Simmons. The other officers elected were: Vice-president, Edward A. Colson, Babcock & Wilcox Company; treasurer, James Plummer, Newport News Shipbuilding Company.

The members of the executive committee are: H. F.

D. G. HODGES has been appointed assistant to the general manager of the Alabama Dry Dock & Shipbuilding Company of Mobile.

R. T. GORDON has been appointed New York district manager of Dean Brothers Company of Indianapolis, manufacturers of pumping equipment.

J. M. HARTMAN, in charge of docks and wharves for the Shipping Board, has resigned, effective December 1, to become general manager of the Boston Tidewater Terminal Company.

RALPH L. LOVELL, formerly chief engineer for the Emergency Fleet Corporation, has been appointed a sales engineer for the Power Specialty Company, handling Foster superheaters and watertube boilers.

EDWARD HANNA, formerly vice-president and general manager of the Hanlon Shipbuilding & Dry Dock Company of Oakland, Cal., recently became manager of the Bethlehem Shipbuilding Plant at San Francisco.

Alexander, Pacific Steamship Company, Seattle; S. I. Cooper, Southern Pacific Company, New York; James S. Milne, Todd Shipbuilding Corporation, New York; Colonel Edward A. Simmons, Simmons-Boardman Publishing Company, New York; A. E. Allen, Westinghouse Electric & Manufacturing Company, New York; W. M. MacFarland, Babcock & Wilcox Company, New York; W. E. Sawhill, editor *Marine Review*, Cleveland; Captain W. H. Stayton, Baltimore Steamship Company, Baltimore.

The executive committee will meet later and select a secretary to succeed K. Warren Heinrich, who has resigned, effective December 1.



Edward A. Colson, Vice-President, American Marine Association

HARRY MEACHEM, formerly New York representative for the Dean Bros. Pump Company, has been appointed vice-president and general manager of the Rider-Ericsson Engine Corporation and the Delamater Iron Works.

F. J. O'CONNOR, of the Donovan Lumber Company, was elected president of the Shipowners' Association of the Pacific Coast, succeeding R. W. Myers of the Hobbs-Wall Lumber Company, at the annual election of officers.

GEORGE O. WALTON, who has been in the steamship and railroad business for many years, has been appointed district passenger manager of the United States Lines, in charge of the territory comprising New York State, southern Connecticut and New Jersey north of Trenton.

CAPTAIN ELMER E. CROWLEY, formerly of the Coastwise Transportation Company of Boston, has been appointed general manager of the Susquehanna Line, Inc., 2 Stone street, New York, to succeed J. B. Austin, Jr., deceased. Captain Crowley has been one of the most active and successful of New England steamship executives.

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes
of Interest in All Branches of the Marine Industries

Catalina Island Line to Build New Passenger Steamer

THE Wilmington Transportation Company, operators of the Catalina Island line of steamers plying between Los Angeles and Avalon, has decided to build a new boat for this service, according to official information obtained by MARINE ENGINEERING AND SHIPPING AGE. J. R. Patrick, president, and William W. Rigley, Jr., chairman of the Board, were in conference at Chicago, Ill., early last month with other company officials and took up, among other things, the question of a new vessel. The specifications have not yet been completed, although it is understood that the steamer will have a length of about 300 feet with a 50 foot beam, to be driven by twin triple expansion engines.

The proposed new steamer will be equipped with all modern features for the two hour run from Los Angeles harbor to Catalina Island and the acquisition of this boat will give the company four ships in this service.

Ship Construction Program Reports Are Again Discussed

REPORTS were again current in marine circles during the past month that the Union Tank Ship Corporation of New York is planning to enter the oil carrying trade on the west coast with eleven new motor tank ships costing approximately \$12,000,000 and pipe lines and leading stations to cost about \$1,000,000. The announcement is credited to Herbert A. Blumenthal, president of the corporation, and refers to a contract with the Sun Shipbuilding Company for the construction of these ships.

Investigation by MARINE ENGINEERING AND SHIPPING AGE disclosed the fact that the Union Tank Ship Corporation has an office at 25 Broadway. From the Chester, Pa., offices of the Sun Shipbuilding Company it was learned that the yard has no contract with the corporation for the proposed vessels. The proposition, it was stated, has been talked about for some time but information as to definite action is lacking. It is understood that the new tankers were to be of the steamship *Bidwell* type. This vessel is one of three ships taken over from the government by the Sun company and converted to Diesel drive. The ship is now at sea, under charter.

Charles Ward Low Bidder for Pipe Line Dredge

Chas. Ward Engineering Works, Charleston, W. Va., with a price of \$427,000, submitted the lowest price for the construction of one 15-inch hydraulic pipe line dredge at the U. S. Engineer Office, Chicago, Ill., on November 15.

Bids Asked for Matson Liner

THE Matson Navigation Company of San Francisco has asked for bids for the construction of a fast passenger and freight liner, according to reports from the West Coast. It is understood that the proposed liner will have accommodations for about 500 first class passengers and that eastern and western shipyards will submit figures on the contract.

F. D. Tenney is president of the company, W. H. Roth, manager, and A. C. Dietrix, assistant manager. The new vessel will probably be put on the San Francisco-Honolulu run.

Passenger Boats Are Planned by New MarMack Company

THE MarMack Transportation Company, Inc., with general offices at 246 Wood Street, Pittsburgh, Pa., has been organized under the laws of the State of Delaware with a capital stock consisting of 10,000 shares of common without nominal or par value and 5,000 shares of preferred stock having a par value of \$100 each. Harry F. Martin is president of the Corporation and Captain James A. McDavid is secretary and treasurer.

The company was organized for the purpose of operating a line of steam vessels of the passenger, freight and excursion type, the excursion vessels to be run to and from the amusement park to be owned and operated by the company in the vicinity of Pittsburgh, Pa. The passenger and freight business is to be between Pittsburgh, Pa., and New Orleans, La. It is the idea of the company to build steamers of the side wheel type, at least one of which is to be large enough to accommodate 5,000 persons in the excursion trade and 500 persons in the passenger trade.

Coastwise Shipping Laws Will Not Be Extended to the Philippines

President Coolidge has no present intention of extending the application of the coastwise shipping laws to the Philippines, it was stated at the White House on November 23. The President has received a report from the State Department which expresses doubt as to the propriety of doing so because of the provisions of certain treaties.

Marine Congress Is to Become a Permanent Body

At a meeting of the Central Committee of the American Marine Congress, on November 9 at the Waldorf-Astoria Hotel, New York, a sub-committee of the Marine Congress was appointed to draft a workable plan for the permanent organization of the Congress.

The sub-committee is composed of the following:

Myron W. Robinson, former president American Manufacturers' Export Association, chairman.

Winthrop L. Marvin, vice-president American Steamship Owners' Association.

C. H. Potter, president United States Ship Operators' Association.

O. E. Bradfute, president American Farm Bureau Federation.

Captain John F. Milliken, secretary of the Neptune Association.

E. E. Spafford, Commander, New York Department, American Legion.

H. A. Magoun, president Atlantic Coast Shipbuilders' Association.

The first meeting of the sub-committee was held at the offices of Colonel E. A. Simmons, former president of the American Marine Association, at 30 Church street, New York on November 21, when plans to consolidate the various shipping organizations throughout the country into the American Marine Congress, to unify and strengthen the efforts now being made to promote the cause of American shipping, were discussed.

As a preliminary step toward the combination the committee has undertaken a canvass of sentiment among existing associations. When this survey is completed another conference will be called at which, if the plan is approved, a constitution and by-laws will be formulated and further steps will be taken to create an effective organization.

The general sentiment at the committee meeting was that the work of educating the public on marine questions, and bringing about co-ordination of all branches of industry on a shipping policy for the country, would be facilitated by a strong central body. Objections to the existing system showed that the separate organizations are frequently working at cross purposes, their efforts are sometimes dissipated for this reason and a centralized association would be more effective. Among the bodies affected by this plan would be the American Marine Association, the Atlantic Coast Shipbuilders' Association, the National Merchant Marine Association and others.

Bids for Steel Towboat Open Dec. 19

The First and Second Mississippi River Districts, 1006 McCall Building, Memphis, Tenn., will receive sealed proposals for furnishing one stern-wheel steel towboat, until 11 A. M., December 19, 1923.



First Annual Banquet of American Marine Congress at the Waldorf-Astoria Hotel, New York, November 8

Construction of 25 Barges Planned

THE construction of 25 new steel barges, to replace wooden barges on the Warrior River, Ala., is under consideration by the U. S. Government Warrior River Barge Line, according to latest advices.

In addition to the 15 new wooden barges, under consideration, the West Kentucky Coal Company of Sturgis, Ky., plans to build 15 additional boats, or a total of 30 in all. The coal company will build all the barges at its ways at Paducah, Ky.

Steel Pontoon Bids

At the opening of tenders by the U. S. Engineer Office, Rock Island, Ill., the Dubuque Boat & Boiler Works, Dubuque, Iowa, submitted the low price for twenty steel discharge pontoons, 38 by 14 by 3 feet, and their bid was recommended for acceptance. Two companies submitted proposals as follows:

Dubuque Boat & Boiler Works, Dubuque, Iowa, \$44,840.

Rock Island Bridge & Iron Works, Rock Island, Ill., \$47,200.

Dravo Gets Barge Work

The Pan-American Petroleum Company, of New York, has awarded a contract for a steel tank barge to the Dravo Contracting Company, Pittsburgh, Pa. The boat will have a length of 200 feet, beam 40 feet, depth 10 feet 6 inches.

The Dravo Company also has a contract for two additional barges, each 120 feet long by 28 feet 6 inches wide and 6 feet 6 inches deep.

Terminal and Dock Project

P. S. Gilchrist, Charlotte, N. C., is reported as having in preparation plans for a phosphate terminal and new dock for the U. S. Export Chemical Corporation, Krause Building, Tampa, Fla. It is understood that the project will cost approximately \$400,000.

The Atlantic Deeper Waterways Association has chosen Newark, N. J., as next year's convention city.

Reconditioning of Three Ships Awarded Federal, One to Staten Island and One to Navy Yard

THE Shipping Board has awarded contracts for reconditioning of the transports *Marne*, *Cantigny*, *Ourcq*, *Tours* and *Aisne* to the Federal Shipbuilding Company, of Kearny, N. J., the Staten Island Shipbuilding Company, of Staten Island, and the Brooklyn Navy Yard, Brooklyn, N. Y. The work on the *Cantigny*, *Marne* and *Tours* has been awarded to the Federal yard for \$1,004,650, for completion within 75 and 100 and 125 days, respectively. The Staten Island yard received the work on the *Ourcq* for \$389,520, to be completed in 100 days

and the Brooklyn Navy Yard obtained the work on the *Aisne* for \$390,000, to be completed in 90 days.

Eleven shipyards submitted bids and two navy yards offered estimates, all of which were taken to Washington by Mr. Gibbs for the final decision.

The ships are to be refitted for cargo and passenger service, the principal items in the specifications providing for the installation of approximately 45,000 feet of new refrigeration space in each vessel and the removal of such material and equipment as was necessary for the putting of the steamers in service as troop ships.

Bids Open December 1 at Mobile for Five Barges

The United States Engineer Office, at Mobile, Ala., will open bids at 11 A. M., December 1, for the construction and delivery of five steel barges. Each boat is to have a length molded of 100 feet, beam 25 feet, depth 5 feet, and to be constructed with cargo boxes, two of the barges being delivered afloat at Lock A, Cumberland River, forty miles below Nashville, Tenn., and three barges delivered at Mobile, Ala.

Southern Company Planning Fleet of River Craft

According to information obtained by MARINE ENGINEERING AND SHIPPING AGE, the American Rolling Mill Company, Ashland, Ky., plans to construct private river terminals at Zanesville, Ohio, on the Muskingum River, and at Ashland, Ky., on the Ohio.

It is said the company plans a large fleet of towboats and barges for its own use.

G. M. Chelf, formerly of the New York office of the Black Diamond Steamship Corporation, is now in charge of the Philadelphia branch of the same line.

Marine Men Witness Test of New Bethlehem Oil Engine

ABOUT one hundred naval architects, marine engineers and ship operators visited the Bethlehem Works of the Bethlehem Steel Company on November 22, on the invitation of the officials of the company, to inspect the new 2,900 brake horsepower Bethlehem two-cycle, single-acting marine oil engine. The engine, designed by Arthur West, has been run an equivalent of 50,000 sea miles without replacements of any sort and without any wear being apparent on the engine.

New Towboat Building

The Evansville Sand & Gravel Company is having a new towboat built at the Evansville Ways Company, Evansville, Ind. The boat is 112 feet long, 24 feet beam, depth 4 feet 3 inches. She is to be equipped with two boilers and also compound engines with 12-inch cylinders and 6-foot stroke.

John Steinman, superintendent of the Buffalo yard of the American Shipbuilding Company, has been appointed superintendent of the Cleveland yard of the company, to fill the vacancy caused by the resignation of the present superintendent.

Current American Shipbuilding

On October 1, 1923, American shipyards were building or under contract to build for private shipowners 226 steel vessels of 160,351 gross tons, compared with 152 steel vessels of 140,929 gross tons on September 1, 1923.

There were 8 wood vessels of 1,004 gross tons building or under contract to build for private shipowners during the

same period, compared with 11 wood vessels of 1,270 gross tons on September 1, 1923.

Following is a summary of reports of shipyards to the Bureau of Navigation, Department of Commerce, showing the number and gross tonnage of steel and wood vessels of 100 gross tons and over under construction or contract for private owners on October 1, 1923:

Companies	Steel		Wood	
	No.	Gross tonnage	No.	Gross tonnage
American Bridge Co., Pittsburgh, Pa.	95	45,050	..	..
American Shipbuilding Co., Cleveland, Ohio.	3	22,784	..	..
Arthur D. Storey, Essex, Mass.	..	..	1	140
B. H. Elliot (Inc.), Houston, Tex.	..	..	1	100
Bath Iron Works, Bath, Me.	1	175	..	..
Bethlehem Shipbuilding Corporation (Ltd.):				
Baltimore Dry Docks Plant, Baltimore, Md.	1	920	..	..
Harlan Plant, Wilmington, Del.	2	792	..	..
Sparrows Point Plant, Sparrows Point, Md.	3	13,600	1	500
Union Plant, San Francisco, Calif.	2	10,000	..	..
Booz Bros., Baltimore, Md.	..	..	1	144
Charles Ward Engineering Works, Charleston, W. Va.	4	1,030	..	..
Craig Shipbuilding Co., Long Beach, Calif.	3	760	..	..
Dravo Contracting Co., Pittsburgh, Pa.	48	15,180	..	..
Federal Shipbuilding Co., Newark, N. J.	1	800	..	..
Geo. Lawley & Son Corporation, Neponset, Mass.	2	550	..	..
Great Lakes Engineering Works, Ashtabula, Ohio.	1	1,600	..	..
Great Lakes Engineering Works, River Rouge, Mich.	1	..	..	..
Howard Shipyards Co., Jeffersonville, Ind.	2	995	..	..
Ira S. Bushey & Sons (Inc.), Brooklyn, N. Y.	..	..	3	..
James Rees & Sons Co., Pittsburgh, Pa.	1	175	..	..
John H. Mathis Co., Camden, N. J.	5	450	..	..
Johnson Iron Works, Dry Dock & Shipbuilding Co., New Orleans, La.	1	250	..	..
Los Angeles Shipbuilding & Dry Dock Corporation, Los Angeles, Calif.	3	710	..	..
Manitowoc Shipbuilding Corporation, Manitowoc, Wis.	2	5,600	..	..
Marietta Manufacturing Co., Point Pleasant, W. Va.	10	3,279	..	..
Nashville Bridge Co., Nashville, Tenn.	4	1,060	..	..
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.	1	1,250	..	..
New York Shipbuilding Corporation, Camden, N. J.	12	16,050	..	..
Pusey & Jones Co., Wilmington, Del.	1	350	..	..
Staten Island Shipbuilding Co., Mariners Harbor, N. Y.	5	1,200	..	..
Sturgeon Bay Dry Dock Co., Sturgeon Bay, Wis.	2	1,000	..	..
Sun Shipbuilding Co., Chester, Pa.	4	1,479	..	..
Supple & Martin Shipbuilding Co., Portland, Ore.	4	266	..	..
Toledo Shipbuilding Co., Toledo, Ohio.	2	13,000	..	..
Vineyard Shipbuilding Co., Milford, Del.	..	..	1	120
Total	226	160,351	8	1,004

Million for P. & R. Piers and Machinery at Port Richmond

IT has been announced that the Philadelphia and Reading Railway Company proposes to spend approximately \$1,000,000 for new machinery, additional piers and other ore-handling equipment at Port Richmond. This equipment is in addition to the \$3,000,000 grain elevator and \$1,000,000 to be spent for a McMyler coal-dumping apparatus.

Since the erection of the present ore pier at Port Richmond twelve years ago the ore plant has had a monthly average capacity of 36,067 tons. During the present year, however, this business has developed so rapidly that additional facilities are necessary.

The plans include the enlargement of Pier 14, and the installation of another set of ore-handling machinery, at an estimated cost of \$915,000. It is said that when this machinery has been installed the machinery on the present pier will be overhauled and renewed as business permits. A pier also will be built south of Pier A, to relieve Pier 14. The approximate cost of this work will be \$600,000. Extensive work also will be done on the boiler house, including the installation of a new 1,000-horsepower boiler.

TRADE PUBLICATIONS

UNDERFEED STOKERS.—The Westinghouse Electric and Manufacturing Company, Stoker Department, South Philadelphia Works, Philadelphia, Pa., describes in some detail the design of a new model multiple retort underfeed stoker. A prominent feature of the new design is the positive control of the contour of the fuel bed. Another feature is the agitating element mounted across the lower end of the stoker adjacent to the retorts which provides a means for maintaining a minimum loss due to combustible in the refuse. The main structure of the stoker is built with heavy supporting members to assure perfect alinement of the parts as well as easy access to an individual part or any group of parts.

WESTINGHOUSE MARINE LOG.—The *Westinghouse Marine Log*, which was initiated as an internal house organ by G. W. Froebel, recently appointed manager of the Westinghouse Marine Department, has made its first appearance for general circulation in marine circles, being distributed to naval and marine officials, shipowners, ship operators, naval architects and port engineers. This issue, which was first distributed at the Marine Exposition, contains a leading article on the "Diesel Electric Drive" by W. E. Thau.

Other articles were written by W. B. Flanders, H. C. Coleman, C. Schmidt, C. C. MacMillan, H. M. Southgate and William H. Easton. Articles are also included, written outside of the Westinghouse organization entirely, by Captain Richard H. Leigh, U. S. N., former commander of the U. S. S. *Tennessee*, and George Pierce of William Cramp and Sons Ship and Engine Building Company.

AIR HOISTS.—Air hoists, patented and built by the Hanna Engineering Works, Chicago, Ill., are described and illustrated with special emphasis given to special features in catalog No. 14 now being sent out by the company. These hoists are designed to meet every known requirement of industry. They embody the simplest possible mechanism and it is stated are free of unnecessary fittings and features that would add to the difficulty of maintenance. The catalog also contains in tabulated form the capacities, weights, code words and other information on Hanna air hoists.

CHARCOAL IRON BOILER TUBES.—An interesting book prepared by the Parkesburg Iron Company, Parkesburg, Pa., outlining the development of process of manufacturing charcoal iron boiler tubes is now available on request. By means of illustrations and descriptive matter the entire story of tubes from the raw material to the finished product is explained.

LIGHTING DATA.—Four bulletins on the use of proper lighting facilities in industry have been compiled by the Department of Publicity, Edison Lamp Works, Harrison, N. J. Two of these on lighting legislation and the lighting of steel mills and foundries will be of special interest to our readers.

FLEXIBLE COUPLINGS.—The new flexible coupling is described in a pamphlet issued by the De Laval Steam Turbine Company, Trenton, N. J. This coupling, which has been developed for turbines or other motors geared or direct coupled to pumps, generators, and similar machinery, consists of two opposed flanges mounted on the driving shafts respectively. One flange carries bolts or pins which enter holes bored in the opposing flange, but not coming into metallic contact with the latter, as the driving force is transmitted through steel-lined molded rubber bushings slipped over the pins. All parts are made to limit gages and all similar parts are interchangeable.

INCREASING MARINE PROFITS.—The Diamond Power Specialty Company, Detroit, Mich., is distributing a new marine bulletin, No. 143, which shows different types of Diamond soot blowers applicable to marine boilers of various designs. Complete details of the blowers with photographs of specific installations and their performances are included in the book.

BETHLEHEM OIL ENGINES.—Based on many years' experience in the design of gas engines, the new two-stroke cycle Diesel engine, built by the Bethlehem Steel Company, Bethlehem, Pa., offers an engine which is American throughout and has numerous features which adapt it particularly well to marine service. A description of the engine, with numerous photographs and drawings showing its construction and special features, is given in catalogue "N" which was distributed at the Marine Exposition and is now available on request to the company. In brief, the engine is of the vertical two-stroke cycle single-acting type constructed in units of 4, 6 or 8 cylinders, running at speeds of from 116 revolutions per minute for land power purposes down to 90 revolutions per minute for marine power installations.

Foreign Shipping and Shipbuilding Activities

Two Battleships of Argentine Navy to Be Reconditioned

AMERICAN and foreign shipyards are reported as preparing proposals for the reconditioning of two battleships of the Argentine navy, the *Moreno* and the *Rivadavia*. These ships are understood to be on their way to the United States and a representative of the Argentine Government has already reached New York presumably to take up details regarding the proposed work.

According to the best information obtainable, the ships will be converted to oil burners and undergo a general overhauling, the contracts involving an expenditure of a large sum of money.

Floating Dry Dock Being Designed for Mexico

THE Des Moines Steel Company, Curry Building, Pittsburgh, Pa., is reported as designing a 6,000-ton floating dry-dock for the Government of Mexico, to be used at Vera Cruz. The dock is to have a length of about 320 feet; width, 100 feet, and light draft, 3 feet 6 inches. It is proposed to build the dock at the company's Pittsburgh Works, floating it down the Ohio and Mississippi Rivers to the Gulf of Mexico, and then to Vera Cruz.

Canadian Pacific Will Add Two Ships to Fleet

E. W. Beatty, K. C., president of the Canadian Pacific Railway, recently addressed a meeting of the Vancouver board of trade and announced that his company proposes to add two large modern steamers to its coast fleet, immediately, to take care of increasing tourist traffic. He also announced the early completion of a new pier at the harbor to cost several millions of dollars.

Government of Queensland in Market for Dredge

Bids are being invited by the Government of Queensland, Australia, on a twin-screw stern-wheel bucket hopper dredger, according to United States Consul Romeyn Wormuth, at Newcastle. The dredger is to have a draft not to exceed 13 feet when fully loaded. The specifications call for a hopper capacity of 16,000 cubic feet and dredging depth of 40 feet below water level and a continuous speed, when fully laden and with bunkers full, of 9 knots per hour. A statement of the earliest date at which the dredger can be delivered complete at the Port of Brisbane should accompany the bid.

The single copy of the specifications received by the Industrial Machinery Division of the Department of Commerce has been placed in the New York office of the Bureau

World's Largest Dry Dock Opened By Governor General of Canada

THE mammoth graving dock built for the St. John Dry Dock and Shipbuilding Company, Ltd., St. John, N. B., was formally opened on Monday, October 26, when the steamer *Kongshaven* entered the dock for repairs to her rudder post, which had been carried away a few days previously. The event was witnessed by guests from all over Canada, the United States and England, including among others Lord Byng, the Governor General, of Canada; Grant Hall, vice-president of the Canadian Pacific Railway; Sir Henry Thornton, president of the Canadian National Railways, Sir Joseph Isherwood of London and New York; James French, principal surveyor for Lloyd's in Canada and United States; James B. Craven of Larchmont and New York; and A. MacCorkindale of the Morse Dry Dock and Repair Company, Brooklyn, N. Y. F. M. Ross, manager of the St. John Dry Dock and

Shipbuilding Company, was on hand to greet all the guests and supervise in general all details.

The dimensions of the graving dock are as follows: Extreme length, 1,225 feet; length on keel blocks, 1,150 feet (the dock can be subdivided by an additional caisson, thus making two docks, one 650 feet long and one 500 feet long); width of dock entrance, top, 133 feet; bottom, 125 feet; draft above sill at ordinary spring tides, 42 feet; bottom of dock below sill, 4 feet 6 inches.

The St. John Dry Dock and Shipbuilding Company also has an 1,800-ton marine railway and the industrial buildings comprise a machine shop, plate shop, boiler shop, pattern shop and joiner shop, all of steel and concrete construction, which will soon be fully equipped with adequate machinery for handling the largest job that can be brought into the dry dock.

French Steamship Company Places Order for Twin Screw Motor Passenger Liner

By Our Paris Correspondent

CONSIDERABLE interest has been aroused in France in connection with the order which has just been placed by the big French steamship company, "Services Contractuels des Messageries Maritimes," for a passenger vessel which is to be propelled by two internal combustion engines developing a total power of about 4,500 horsepower. The extreme scarcity of motorships so far under construction in France, which I pointed out in the May issue, is responsible for the stir aroused by this recent development.

So far only one motorship is under construction in French shipyards, the *Camrahn*, a cargo vessel of 11,700 tons deadweight built by the Chantiers de la Loire to the account of the Chargeurs Reunis. The hull of that vessel is still unfinished at Nantes, while the engines have been delivered months ago.

The order for the motorship of the Messageries Maritimes has been placed with the Chantiers de France at Dunkirk. The vessel will be built to the same design as the *Sphinx*, a type of vessel which is run by the company on the Mediterranean lines. But it is noteworthy that the hull only will be built by the Chantiers de France, while the engines will be supplied by either Burmeister & Wain or the Sulzer Bros.

of Foreign and Domestic Commerce, where it may be consulted by interested manufacturers.

Consul Wormuth states that he has been informed that twelve copies of the contract and specifications have been forwarded to the State Engineer, Albany, N. Y., and that another set is available at the office of the trade commissioner for Australia, 44 Whitehall Street, New York, N. Y.

According to recent reports, it is likely that the order will be placed with the latter concern and that the engines will be built at the Saint-Denis (near Paris) works of the French branch of Sulzer Bros. It will be recalled that the engines of the *Camrahn* have been supplied by the same concern which had these engines built at its Winterthur works (Switzerland).

Now that two big French steamship companies have decided on a first experiment of internal combustion engines, there is some speculation as to whether other firms will follow these examples in the near future.

FRENCH LINE TO RESUME CANADIAN SERVICE

It is learned that the French Line has just decided to resume its regular service with Canada, which was suspended at the beginning of the war. The home port, however, is to be Bordeaux instead of Havre as before the war. Two passenger vessels will be placed on this run: the *Roussillon* (ex-German *Goeben*), 8,819 tons gross, and *La Bourdonnais* (ex-German *Scharhorst*), 8,287 tons gross. Calls will be made at Halifax on the outward route of the two vessels which will sail from Bordeaux every 21 days. On the homeward voyages they will call at Vigo before reaching Bordeaux. The first call at Halifax will be made on December 2.

It is noteworthy that so far no French company is running regular passenger and cargo services to Canada; this service is being maintained from Havre by two American companies.

Another interesting development in connection with French shipping is the recent organization of regular services between French ports and Petersburg by the Messageries Maritimes. This is the first resumption of services with Russia.

Marine Construction News of the Month

Ship Contracts—New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPBUILDING AND REPAIRS

Tanker Drydocked, Galveston, Tex.—The tanker E. B. Kemp has been drydocked for repairs at Galveston.

Steamship Overhauling, Portland, Ore.—The steamer West Jena, of the Shipping Board, has been drydocked at Portland for overhauling.

Miscellaneous Repairs, Philadelphia, Pa.—The Cramp Shipbuilding yard was awarded miscellaneous repairs to the Norwegian motor tanker Hamlet.

Repairs to Steamer, Charleston, S. C.—Steamship Janelaw has been placed on the ways of the Charleston Dry Dock and Machine Company for repairs.

Damage Repairs, San Francisco, Cal.—The steamer Elizabeth, which recently went ashore at Bandon, Ore., has been taken to San Francisco for drydocking for repairs.

Oil Carrying Barge Launched, Chester, Pa.—The Sun Shipbuilding and Drydock Company has launched a 140-foot, 5,000 barrel oil carrying barge for the New York Central Railroad.

British Tanker Reconditioning, San Pedro, Cal.—The giant British tanker Albertolite has been drydocked at San Pedro to undergo reconditioning preparatory to a cruise to Chile.

British Steamer Repairs, Chester, Pa.—The British steamship Nowshera has been taken to the Sun Shipbuilding and Drydock Company's yards for drydocking and miscellaneous repairs.

Fire Damage, West Coast.—The freighter Diana Dollar, which caught fire off the Mexican coast recently, has suffered damages estimated at \$500,000, according to messages from her master.

Steamer Segvia Repairs, Charleston, S. C.—After having grounded recently while on her way to Europe from Galveston, the steamship Segvia was taken to the Charleston Drydock & Machine Company to undergo repairs.

West Arrow Drydocked, Boston, Mass.—The American steamship West Arrow, recently in collision with the White Star liner Haverford, has been taken to Boston for drydocking for survey. Her forepeak tank was crushed in and five plates broken.

Steamer Drydocked, Newport News, Va.—The Danish steamer Norden, damaged recently by grounding off the Canadian coast, has been taken to the docks of the Newport News Shipbuilding and Dry Dock Company for surveying and repairing.

Ship Repair Revival, Philadelphia, Pa.—A revival in the repair branch of the shipbuilding industry in the Delaware River district has been reported by J. Harry Mull, president of the William Cramp & Sons Ship & Engine Building Company at Philadelphia.

Steamers Drydocked, San Francisco, Cal.—The Government freighter West Montop has been placed on the Bethlehem drydock to have a new tail shaft and other work performed and the tanker China Arrow went on drydock at the same yard for general repairs.

Bids to Be Asked, Boston, Mass.—The steamer City of Rockland, which went ashore on Dix Island while bound from Bath for Boston, has been floated. The Eastern Steamship Lines, Inc., owners, will ask for bids to recondition the vessel, which is said to be badly damaged.

Steamship Drydocked for Repairs, Charleston, S. C.—The Springfield has been withdrawn from the service of the Carolina Company of Charleston and has been drydocked for repairs. It is stated that after repairs are completed the vessel may be reallocated by the Shipping Board.

Raised Vessel to Undergo Repairs, Charleston, W. Va.—The steamship Springfield, recently rammed and sunk by a Clyde Line steamer in St. John's river in Jacksonville, Fla., has been raised and taken to the yard of the Charleston Dry Dock and Machine Company for repairs.

Dredge, Portland, Ore.—The Port of Portland, Spalding Building, is having plans prepared for dredge to be equipped with four 750 horsepower Diesel engines and 30-inch suction and discharge pipe. J. H. Polhemus, general manager; G. B. Hegardt, Stark Street Dock, engineer.

Rudder Test, Bridgeport, Conn.—It has been announced that the Kitchen patent rudder has undergone a successful test aboard the yacht Wanda II off Bridgeport, Conn. The yacht, which is electrically controlled, is said to have stopped during the tests in one and one-half times her length in eighteen seconds from full-speed-ahead motion.

Leviathan to be Drydocked, Boston, Mass.—The Leviathan will be laid up for three months this winter, upon the completion of her next voyage, after her arrival in New York on November 26. She will go to the Commonwealth drydock in Boston after leaving the Shipping Board piers at Hoboken and will return to service in the early spring.

President Wilson Bids, West Coast.—At the opening of tenders for carrying out repairs on the Pacific Mail liner President Wilson the following companies submitted bids: United Engineering, \$1,712; General Engineering, \$2,282; Moore Drydock Company, \$2,293, and Smith & Scanlon, \$3,890. The specifications covered work on her engines.

Ships to Burn Oil.—The Japanese steamship line, Toyo Kisen Kaisha, has decided to convert the Tenyo Maru and the Shinyo Maru, operated on the Transpacific service, into Diesel engine motorships and has ordered the engines from Germany, according to recent London reports, the company having appropriated for their conversion 1,000,000 yen.

Vessel Launched, Newport News, Va.—The City of Birmingham, building at Newport News for the Ocean Steamship Company, has been launched. Her general dimensions are: length over all, 400 feet; beam, 52 feet; depth molded to hurricane deck, 35 feet; draft fully loaded, 18 feet 6 inches. She has a gross tonnage of 6,500 tons, an indicated horsepower of 2,900, and a speed of 12½ knots.

Installation of Radio Finders, West Coast.—Kolster radio direction finders are to be installed on five of the Matson Navigation Company's six-passenger steamers and two of its largest freighters. The H. F. Alexander, of the Admiral Line, was the first Pacific Coast vessel to have a radio direction finder installed. The Admiral Line officials have ordered six more finders to be installed on their coastwise vessels.

Salvage, Pacific Coast.—It has been learned that Merritt, Chapman and Scott have been commissioned by the United States Navy to salvage all available gear, etc., from the seven destroyers which recently went on the rocks during a fog on the California Coast. There is very little or no hope of saving any of the vessels. When the salvage operations are complete, it is expected that the wrecks will be blown up.

Shipyard Work, Chester, Pa.—The Sun Shipbuilding and Drydock Company, Chester, was awarded the work of drydocking the steamship West Inskip and also the Herbert L. Pratt for general repairs. The same company was the successful bidder against the Newport News Shipbuilding Company for the contract to repair the British steamship Nile, which requires drydocking to paint and scrape bottom, with a possibility of renewing her propeller and also the tailshaft.

Shipyard Activities, West Coast.—The General Engineering and Drydock Company submitted the lowest figures on the following work. Government steamer Angel: General Engineering, \$1,212; Han-

lon Drydock Company, \$1,511; Bethlehem Shipbuilding, \$1,653, and the Moore Drydock Company, \$1,704. Prices for work on the Hoven were: General Engineering and Drydock Company, \$1,888; United Engineering Company, \$1,938; Moore, \$2,162, and Bethlehem, \$2,358.

Ship Contracts, New Orleans, La.—The Johnson Iron Works, New Orleans, has been awarded the following work: Tampa Inter-Ocean Steamship Company's steamer Narbo, general repairs, consisting of drydocking, painting, pulling tail shaft and overhauling of auxiliaries; installation of new furnaces in all boilers on steamship Moranzania, of Vacaro Brothers, and general repairs to the West Ira, of Lykes Brothers, consisting of drydocking, painting, and pulling tailshaft.

Diesel Yacht Launched.—According to announcement by Cox & Stevens, designers of the ocean-going Diesel yacht Vanadis, the vessel was successfully launched on November 15 and will be delivered to her owner, C. K. G. Billings, early in 1924. The Vanadis has a length of 240 feet, beam 35 feet, draft 14 feet, and has two Diesel engines developing 1,800 horsepower, which produces a speed of fourteen knots with a cruising radius of 12,000 miles. She is said to be the largest Diesel yacht yet constructed.

Diesel Dredges Launched, Chester, Pa.—The A. McKenzie and the W. L. Marshall were launched on November 19 at the Chester plant of the Sun Shipbuilding Company. These Diesel electric dredges were built by the Sun yard for the engineering corps of the War Department. They will be delivered in January and February. The Dan C. Kingman and the William T. Russell will be launched in March and April. The dredges are 245 feet long, 46 feet beam and 19 feet 6 inches loaded draft, and are of 2,000 deadweight tons each.

Ship Work, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, Mobile, Ala., has been awarded the following work: Steamship Hancock County, renewing of heater tubes and tube sheet and heater installation; Coast Guard cutter Tallapoosa, repairs to collision damage; steamship Shenandoah, engine repairs; steamer Scott, of Mississippi-Warrior Service, boring and fitting two propeller wheels to shaft; steamship Lysefjord, extensive reconditioning; tug Jim Sid, boiler repairs; and a joiner job on the steamer Bay Queen.

Warships Overhauling, Brooklyn, N. Y.—For a general overhauling the battleships Arkansas and Wyoming and the destroyers Goff, Gilmer, J. Paulding, Fox, Barry, Williams, Hatfield, Overton and King have arrived at the Brooklyn Navy Yard. The same yard has obtained several other jobs, including reconditioning of the Shipping Board freighter Aisne and the cutting up of the partly completed battleships South Dakota and Indiana. This work will prevent the lay-off of workman planned for January 1 and will result in hiring additional men, according to the yard.

Dispatch Boat Conversions, South America.—The Bethlehem Shipbuilding Corporation has been awarded the contract for considerable work on two ships of the Aviso class (dispatch boats) for the Argentine navy. Each vessel is equipped with three Thornycroft boilers, the contract calling for the installation of the Bethlehem-Dahl fuel oil burning system with pumps, heaters, strainers, etc. The contract also requires that the boilers be capable of burning any kind of oil on the market and each fireroom is to be fitted as a separate unit. The work will be done at the Argentine navy dock yards.

Repair Contracts, Buffalo, N. Y.—The Buffalo Dry Dock Company is engaged in installing a new wheel and new tail shaft on the steamer Juniata, passenger steamer of the Great Lakes Transit Corporation, and also installing a new wheel on the tug A. C. Dutton, of the Rochester Terminals and Canal Corporation. The Riley Dry Dock Company,

Buffalo, is engaged in the following work: Docking the lake barge Richland Star, of the Benjamin Iron Company, and the tug Saginaw, for minor hull repairs. The same company has completed extensive repairs on the steam barge Mohegan, of the Inland Marine Corporation.

Ship Work, Great Lakes.—The following ship work has been awarded on the Great Lakes: Steamer Malietoa, drydocked at Cleveland for repairs to leak caused by grounding; steamer Conneaut, docked at Ashtabula for repairs to stern tube; steamer Glenisla, drydocked at Collingwood for repairs to collision and grounding damage, and the Berryton, repairing at Port Arthur as a result of collision, at which time the steamer's stern was shoved in several inches, her hawse pipe broken and eighteen plates damaged. The Bennington, which collided with the Berryton, is having temporary repairs at Ecorse. She also has eighteen damaged plates.

Transports to Be Rebuilt, South Atlantic Yards. Two United States Army transports Marne and Oureq, which were turned over to the Shipping Board several months ago to be laid up with the steel fleet in the James River, near Camp Eustis, have been taken to Newport News and Norfolk to be made ready for service. These transports, built during the war for use of the United States Army Transport Service, but not completed in time to transport troops, are 448 feet long with a 58-foot beam and have ample accommodations for passengers and freight. Certain alterations would be necessary to make them suitable for the combination freight and passenger service between New York and London, but officials are of the opinion that that could be done easily, quickly and economically.

Ship Work, San Francisco, Cal.—The General Engineering and Drydock Company has received the following contracts: Associated Oil Company's tanker Kewanee, general repairs, preparatory to undergoing annual inspection; Standard Oil tanker J. A. Moffett, repairs; dredge Big V., extensive alterations, having been idle some time; yacht Shawnee, cleaning, painting and repairs to propeller; steamer Point Arena, reconditioning and drawing tail shaft; Shipping Board steamer Pallas, new line shafting and new spring bearings and general repairs; ferryboat Golden West, drydocking, cleaning and painting and drawing tail shaft; Mexican steamer Bolivar, changing from coal to oil-burning equipment and drawing tail shaft, and the fishing tugs Henrietta and Islander, undergoing miscellaneous repairs and cleaning and painting.

Shipyard Work, West Coast.—The Bethlehem Shipbuilding Corporation, San Francisco, Cal., is engaged in the following work: cleaning, painting and repairing the propeller of the John Line's Swedish motorship San Francisco; cleaning, painting and drawing of the tailshaft on the Shipping Board steamer West Conob; refitting of the starboard propeller on the British motorship Hauraki, of the Hind, Rolph & Company; rudder and propeller repairs to the McCormick Steamship Company's steam schooner Cello; fitting of propellers on the new steam schooner Esther Johnson, of the A. B. Johnson Company, preparatory to undergoing trial trip; hull repairs on the Union Oil Company's tanker La Placencia; miscellaneous repairs to the Mexican, of the American-Hawaiian Line. At present the Bethlehem yards are engaged in reconditioning the American-Hawaiian freighter Dakotan, following her mishap on the Lower California coast some time ago, this work representing an expenditure of approximately \$100,000.

SHIPYARDS AND DRY DOCKS

New Dock Placed in Service, Brooklyn, N. Y.—On November 20 the new 10,000-ton floating dock at the Robins plant of the Todd Shipyards Corporation was placed in service, the tanker Gulfoil of the Gulf Refining Company being the first vessel to be docked. The Robins yard now has a total of two graving docks and four floating docks, bringing the total dock equipment of the Todd Corporation up to twenty-two floating docks and two graving docks.

Company Resumes Activity, Fairfield, Md.—The Union Shipbuilding Company has reorganized its repair department plant at Fairfield, Md., according to word from Baltimore. A new manganese steel hauling chain has been installed on the marine railway drydock, which will raise vessels 415 feet long and of 5,000 tons displacement. The railway is constructed so that vessels are lifted vertically out of the water on practically an even keel while being

hauled on the railway. This is said to eliminate any tendency to strain the ship's structure.

Repair Plant, Wilmington, N. C.—One of the biggest fish oil manufacturing concerns operating along the Atlantic Coast, the Fisheries Products Company, has purchased from a Baltimore concern an extensive portion of the old Carolina shipyard and will operate at the water front site a shipbuilding and repair plant, including extensive machine shops, ship ways, a marine railway and other such equipment necessary for the operation of a first-class shipyard and repair plant. P. H. Hayes, president of the company, stated that his company had purchased it at auction at a cost of \$19,100 all of the unsold portion of the old shipyard and that plans are now under way for the conversion of this property into a shipyard and repair plant, not alone for the building of additional vessels for their fishing fleet and the maintenance of the 24 fishing vessels they now operate, but also for commercial ship work.

PORT IMPROVEMENTS

Retaining Walls, etc., Ohio.—State Highway Department, Columbus, will build new retaining walls at Buckeye Lake in Fairfield and Licking Counties. \$40,000. P. R. Murray, director.

Dredging, etc., Akron, Ohio.—City plans beautifying shores of Summit Lake, by dredging and draining the shore lands and building lagoon system in wider points, etc. \$250,000.

Breakwater, Long Beach, Cal.—Plans are being made by the city for a 3,000-foot breakwater in the vicinity of Pine Avenue Pier, 350,000 tons of rock. C. H. Windham, city manager.

Crane, Newark, N. J.—Riverside Steel Casting Company, Plank Road and Passaic River, is in the market for one 10-ton, 40-foot span electric traveling crane.

Channel Excavation, Toronto, Ont.—Sealed proposals were received on October 15, by A. Beck, chairman, Hydro Electric Power Commission, 190 University Avenue, for excavation of tailrace channel, 20,000 cubic yards of rock.

Repairs Completed, Seattle, Wash.—Repairs to Pier B, Smith's Cove public terminal, the largest ocean dock in the world, have been completed. This pier, more than half a mile long and a city block wide, was damaged by fire.

Contract Awarded, Pittsburg, Kan.—C. Hotz & Son awarded the contract for the first unit grain elevator, 170,000 bushels (capacity to be doubled at later date), to Southwest Engineering Company, Woodruff Building, Springfield, Mo. \$35,000.

Breakwater, Corpus Christi, Tex.—City and Nueces County Navigation, District 1, postponed opening bids and will revise plans and re-advertise for constructing breakwater, protecting levee around turning basin and also dredging in turning basin.

Grain Elevator, Oswego, N. Y.—The Board of Public Works, Albany, awarded the contract for constructing and equipping a grain elevator, five-story, 60 by 213 feet, reinforced-concrete and steel, here, to James Stewart Company, Inc., 30 Church Street, New York. \$1,119,959.

Dock Terminal, etc., Tampa, Fla.—The U. S. Export Chemical Corporation, Krause Building, is having plans prepared for dock terminal elevators and plant for manufacture of double super-phosphate. \$400,000. Address, P. S. Gilchrist, Charlotte, N. C., engineer and architect.

Levees, Clarksdale, Miss.—Sealed proposals were received on October 9 by the Board of Levee Commissioners for Yazoo-Mississippi Delta, for enlarging five-mile old Ward Lake levee, 75,000 cubic yard banquet enlargement, and 10,000 cubic yards of topping. W. L. Head, chief engineer.

Dredging Ship Channel, Tampa, Fla.—U. S. Chemical Export Corporation, Krause Building, is making plans and estimates for dredging ship channel from mouth of Alafia River to main ship channel, 1,000,000 cubic yards excavation. \$400,000. P. S. Gilchrist, Charlotte, N. C., engineer.

Creosoted Piling, etc., Mayersville, Miss.—First and Second Road District, Mayersville, awarded the contract for 2,650 lineal feet of creosoted piling, 6,120 feet of creosoted lumber and 50,000 feet of untreated lumber delivered at Flanton Station, to Creosote Materials Company, Q and C Building, New Orleans, La.

Contract Awarded, Lake Charles, La.—Police Jury, Calcasieu Parish, awarded the contract for navigation channel from Lake Charles to Sabine River, 125 feet wide, 30 feet deep, Section 1, 2,780,000 cubic yards, to United Dredge Company, Galveston, Tex., \$383,640; Section 2, 3,270,000 cubic yards, to Smith Brothers, Alexandria, \$457,800.

Lumber and Piles, New York, N. Y.—E. W. Buckley, commissioner, Department of Purchase, Municipal Building, awarded the contracts for lumber and piles to Department of Docks, to Robinson Lumber Company, New York, \$113,622; Cooney, Eckstein & Company, 302 Broadway, \$9,837; J. A. Maloney & Company, 1170 Broadway, \$4,464.

Beaumont, Tex., Wharf Contract.—The Houston Construction Company, 3102 McKinney Avenue, Houston, Texas, has received the contract to build wharves and to dredge at Beaumont. The project includes the following: Dredging, filling, 75,000 yards; concrete wharf platform, and concrete and timber bulkhead; the total cost of the job being \$267,410.

Waterway Opened, Lake Okeechobee, Fla.—Lake Okeechobee, the second largest body of fresh water in the United States, has been linked with the Atlantic Ocean, sixty-five miles away. The inlet, which extends from the lake to the ocean, was formally opened with fitting exercises and will be navigable to yachts and freighters drawing not more than ten feet of water.

Marine Cables, St. Louis, Mo.—Union Electric Light and Power Company, 12th and Locust Streets, awarded the contract for laying 12 marine cables on Mississippi River bed carrying 12,000 kilowatts of power, connecting Cahokia, Ill., power plant with St. Louis, Mo., station, to Frulin-Colnon Construction Company, Merchants Laclede Building. Engineer's estimate, \$156,000.

Fire Protection System, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Orleans Court Building, on October 11, for a fire protection system at the Sacking Plant of the Public Grain Elevator, comprising extension of existing mains and installation of hydrants and automatic sprinklers. Requisition E. D. 14014. J. H. Walsh, general manager.

Fill, etc., Portland, Ore.—The Port of Portland plans filling Guild Lake, and 1,200 acres adjoining; straightening and deepening Willamette River and Harbor, involving 3,032,760 cubic yards of dredging, \$170,000. Plans are being made for dredge equipped with four 750 horsepower Diesel engines and 30-inch suction and discharge pipe. J. H. Polhemus, Spalding Building, general manager. G. B. Hegardt, Stark Street Dock, engineer.

Buffalo Harbor Improvements.—Major P. S. Reinike, United States District Engineer, Buffalo, N. Y., unfavorably reported to Washington on several recommendations made by the Buffalo City Council, the Buffalo Chamber of Commerce, and the City Planning Commission. Major Reinike's statement says that the middle gap in the breakwater of Buffalo harbor should not be closed as recommended, because the closing would create an unfavorable current through the harbor. He opposes the dredging of the Erie Basin on the ground that it is state property, part of the Barge Canal System, and could not be dredged by the federal government. Major Reinike held that the recommendation of the Lake Carriers' Association that another breakwater be constructed one mile outside the present one, or that twelve feet be added to the height of the present one would create an expense in construction that would not be commensurate with the benefits to be derived. Favorable action is expected on the recommended removal of a triangular point of rock from the entrance of the Black Rock canal and for the widening of the ship canal south of the International Bridge and the removal of shoal opposite Rattlesnake Island in the Niagara River.

GOVERNMENT WORK

Dredging, Bridgeport, Conn.—Sealed proposals were received on October 17 at the office of the U. S. Engineer, Providence, R. I., for dredging in Bridgeport Harbor.

Repairs to Seawall, Hingham, Mass.—Specification 4902—The Bureau of Yards & Docks, Navy Department, Washington, D. C., plans repairs to seawall of slip at Hingham.

Mooring Masts, Washington, D. C.—Specification

4916—The Bureau of Yards & Docks, Navy Department, plans mooring masts at Guantanamo, Cuba; Fort Worth, Tex., and San Diego, Cal.

Bids Rejected for Piers and Wharf, Pearl Harbor, H. T.—Bureau of Yards and Docks, Navy Department, Washington, D. C., rejected bids for reinforced concrete piers and wharf at Submarine Base, here.

Catamarans, etc., Chicago, Ill.—Sealed proposals were received on November 1, at the office of the U. S. Engineer, 537 South Dearborn Street, for catamarans and pipe for 15-inch hydraulic pipe line dredge.

Repairing Jetty, Freeport, Tex.—Sealed proposals were received by the U. S. Engineer Office, Galveston, Tex., on October 31 for repairing Southwest Jetty at Freeport Harbor, Tex. Further information on application.

Steel, etc., Addison, Ky.—U. S. Engineer, P. O. Box 72, Louisville, plans purchasing one carload of 1-inch round soft steel, shop lengths, and 3,200 pounds of c.i. washers, 4 inches in diameter, for Dam 45, Addison, Ky.

Contract Awarded, Norwalk, Conn.—U. S. Engineer Office, Providence, R. I., awarded the contract for dredging 500,000 cubic yards in Norwalk Harbor to J. S. Packard Dredging Company, Turks Head Building, Providence, R. I. \$89,321.

Superstructure, Ludington, Mich.—U. S. Engineer, Milwaukee, awarded the contract for removing timber superstructure and construction of concrete superstructure, Ludington, to S. M. Siesel Company, 160 Ogden Avenue, Milwaukee, Wis. \$149,690.

Dredging, etc., New York, N. Y.—The contract for dredging and rock removal Area 2, New York and New Jersey Channels, has been awarded by the U. S. Engineer Office, 616 Army Building, New York, to E. Breyman, 17 Battery Place. \$577,343.

SHIPPING DEVELOPMENTS

Pacific Mail Steamship Company.—The Pacific Mail Steamship Company has announced a cut in minimum first class rates between New York and Los Angeles, the fare being reduced from \$270 to \$250. The Pacific Mail operates in the intercoastal service.

Mississippi-Warrior Federal Barge Line.—While the Mississippi-Warrior Federal Barge Line earned a net income of \$13,632.27 in the final six months of the fiscal year ended June 30, 1923, it was not sufficient to absorb the losses of the first half of the year and the report sent to Washington shows a loss for the year of \$624,796.62, as compared with a net profit of \$121,017 for 1921-22.

General Steamship Corporation.—Four Diesel-driven vessels, built since the World War and reputed admirably adapted for the demands of the west coast trade, are to be operated by the General Steamship Corporation between Portland and other Pacific Coast ports and those on the western shores of South America, beginning in December, upon the retirement of the Shipping Board fleet at present on the route and which is managed by the same corporation.

Davis Transportation Lines, Inc.—Control of the Charles W. Davis Transportation Company, owning and operating two steamers between New York, New Rochelle, Mamaroneck and other interior points, has been acquired by Matthew C. Brush and George R. Whitlam, heading a group of New York shipping men. The name of the company has been changed to the Davis Transportation Lines, Inc., and plans for increasing the facilities and extension of the service are under way.

New Line to the Orient.—A new steamship line to the Orient, with headquarters at Los Angeles, is being formed by a group of prominent capitalists, according to Lawrence L. Larrabee, Los Angeles attorney, who is acting as general counsel for the company. Articles of incorporation are pending and negotiations are in progress with the Shipping Board for the purchase of three steamers to be placed in the service. Two of these steamers will be 10,000 tons deadweight and will be used for freight only, while the third steamer will be 21,000 tons deadweight and will be used as a combination passenger and freight carrier.

Garland Steamship Corporation.—The Garland Steamship Corporation has announced its withdrawal from the intercoastal trade and the establishment of a trans-Pacific service in January. On the West Coast, San Francisco and Portland will be regular

ports of call and stops will be made in Shanghai, Hongkong and Manila in the Far East. William M. Campion, vice-president of the line, said the new service will start with the William Campion, sailing from Portland early in January, to be followed at fortnightly intervals by the six other ships of the company. The company expects to maintain a regular schedule, with sailings every two weeks from San Francisco and Portland. The executive office will remain in New York, but the principal operating office will be in San Francisco.

American-Hawaiian Steamship Company.—The American-Hawaiian Steamship Company, which operates an intercoastal service between U. S. Atlantic and U. S. Pacific Coast ports, has announced that in addition to ferry car service which has been in operation to New York for some time past in connection with the West Shore, New York, Ontario & Western, Delaware, Lackawanna & Western, and New York, New Haven & Hartford, arrangements have now been completed for ferry car service with the Erie Railroad and New York Central Railroad. When shipments consigned care of American-Hawaiian Steamship Company, Pier 6, Bush Terminal, South Brooklyn, N. Y., move in ferry cars, the only charge incurred is 5 cents per 100 pounds to cover cost of car unloading.

International Mercantile Marine.—An important announcement has just been made by the International Mercantile Marine Company in connection with the service of the Leyland Line between Boston, Liverpool and Manchester. Beginning this month a definite ten days' schedule of sailings will be inaugurated, and in order to maintain this increased service six modern steamers of large carrying capacity have been assigned to the route. These are the steamships Nubian, Darian, Caledonian, Daytonian and Colonian. Each steamer has a carrying capacity for about 10,000 tons of cargo, and most of them are equipped with refrigerating machinery for transporting merchandise of a perishable nature. The new schedule will be inaugurated by the sailing of the Nubian from the port of Boston on December 12 to Manchester and Liverpool, and thereafter there will be sailings at intervals of about ten days.

Canadian Government Merchant Marine, Ltd.—According to an announcement by the Canadian Government Merchant Marine, Ltd., a new monthly direct service between Vancouver, B. C., and Avonmouth, England, via the Panama Canal, was inaugurated by the sailing of the Canadian Winner on October 20. The steamers will carry eastbound grain, canned goods, general cargo and lumber, and westbound iron and steel goods, liquors and general cargo. In inaugurating this new service, it is stated, the company is carrying out its policy of opening up and taking care of new trade routes. The service is also intended to be a factor in the development of the port of Vancouver, utilizing the grain elevator accommodation and other facilities provided at that port. Following the Canadian Winner, the Canadian Prospector sailed from Vancouver on November 20. It is the intention of the Canadian Government Merchant Marine to keep four of their 8,400 deadweight steamers on the new service.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers

Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers

29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers

29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute

Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association

15 Park Row, New York
President—Frank J. Shipman.

The New York Tow Boat Exchange

11 Moore St., New York.
Secretary—Irrving G. Keller.

Port of New York Authority

11 Broadway, New York
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association

Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots

National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers

Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association

Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association

1600 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association

11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association

149 Broadway, New York
President—C. H. Potter.

National Merchant Marine Association

Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York

78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association

Detroit, Mich.
Secretary—George A. Marr.

Neptune Association

21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers

15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada

Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects

5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland

39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders

Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated

The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Navale e Meccanici in Italia

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